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BUREAU OF FISHERIES

Division of Fishes,  
U. S. National Museum

REPORT  
OF THE  
UNITED STATES  
COMMISSIONER OF FISHERIES

FOR THE FISCAL YEAR 1916

WITH

APPENDIXES

HUGH M. SMITH

Commissioner



WASHINGTON  
GOVERNMENT PRINTING OFFICE

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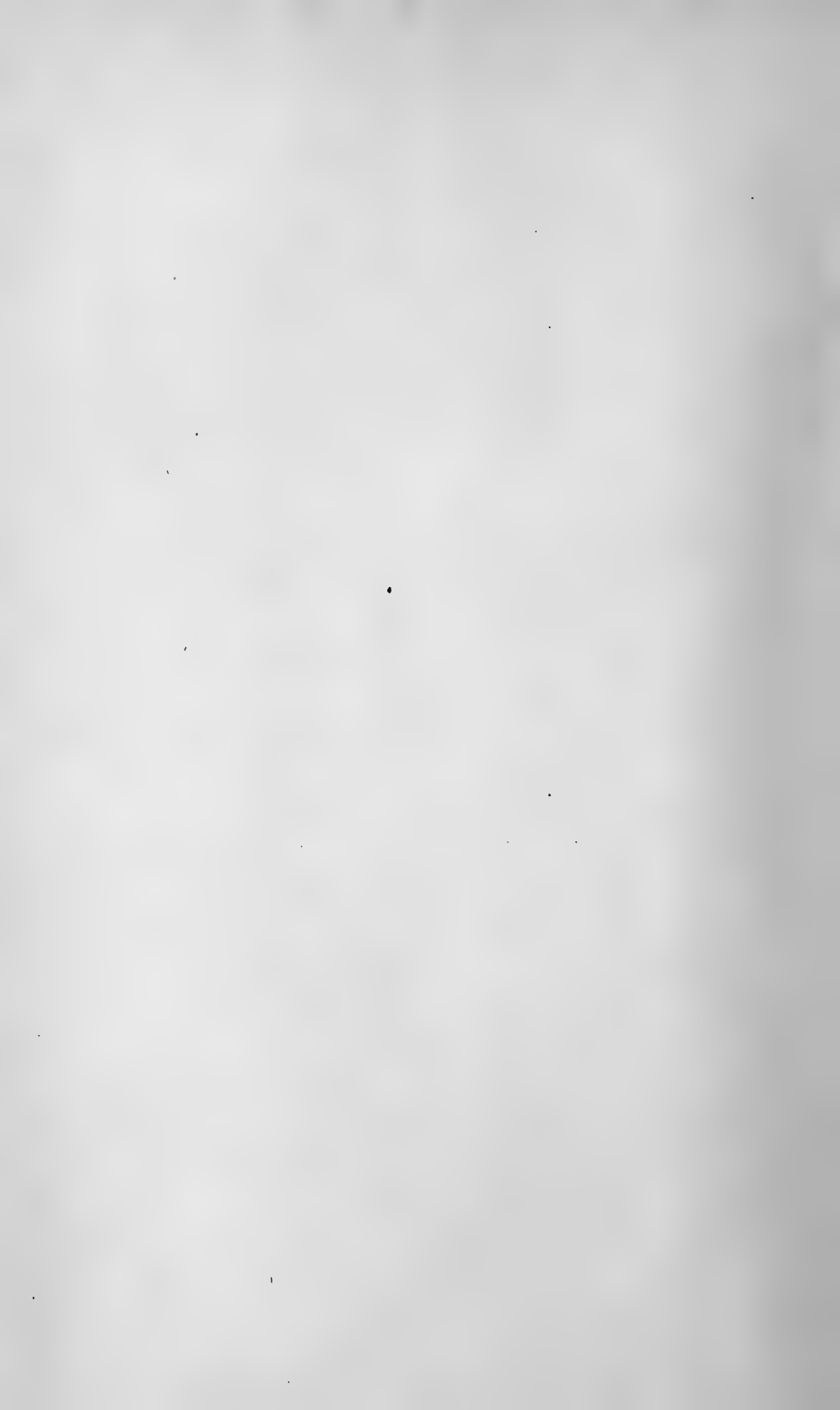
- REPORT OF THE COMMISSIONER OF FISHERIES FOR THE FISCAL YEAR ENDED JUNE 30, 1916. (Document No. 836, 114 p. Issued December 16, 1916.)
- THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1916. Appendix I, 111 p. (Document No. 837. Issued February 26, 1917.)
- ALASKA FISHERIES AND FUR INDUSTRIES IN 1916. Appendix II, 118 p. (Document No. 838. Issued August 14, 1917.)
- PACIFIC SALMON FISHERIES. By John N. Cobb. Appendix III, 255 p., 29 pl. (Document No. 839. Issued June 9, 1917.)
- FISH LAWS OF MISSISSIPPI RIVER STATES. By Emerson Stringham. Appendix IV, 16 p. (Document No. 840. Issued February 1, 1917.)
- CONDITION AND EXTENT OF THE NATURAL BEDS AND BARREN BOTTOMS IN THE VICINITY OF APALACHICOLA, FLA. By Ernest Danglade. Appendix V, 68 p., 7 pl., 1 chart. (Document No. 841. Issued March 22, 1917.)
- FISHING IN THE PRIAMUR DISTRICT OF SIBERIA. By John K. Caldwell. Appendix VI, 31 p. (Document No. 844. Issued June 21, 1917.)



**REPORT OF THE  
UNITED STATES COMMISSIONER OF FISHERIES  
FOR THE FISCAL YEAR ENDED  
JUNE 30, 1916**

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Bureau of Fisheries Document 836



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# REPORT OF THE COMMISSIONER OF FISHERIES.

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DEPARTMENT OF COMMERCE,  
BUREAU OF FISHERIES,  
*Washington, October 9, 1916.*

SIR: There is submitted herewith a report giving an outline of the operations of the Bureau of Fisheries during the fiscal year ended June 30, 1916.

## GENERAL REVIEW.

On February 9, 1916, the Bureau of Fisheries celebrated the forty-fifth anniversary of its establishment as a commission with purely investigatory functions. Public exercises were held in the auditorium of the National Museum, and the occasion was largely devoted to the dedication of a bronze memorial tablet to Spencer Fullerton Baird, the founder and first commissioner of the Bureau. The tablet was provided by the private subscriptions of persons now in the Bureau who were there under Prof. Baird; by persons who were officially associated with Prof. Baird in the fishery work but who are no longer connected with it; by a few who, while never in the regular fishery service, were closely connected with it in the days when Prof. Baird was Assistant Secretary and later Secretary of the Smithsonian Institution and Director of the National Museum as well as Commissioner of Fisheries; and by some persons who, in later years, have been officially engaged in some of the varied operations to which Prof. Baird gave impetus. The memorial contained a medallion portrait and the following inscription:

SPENCER FULLERTON BAIRD

1823-1887

FOUNDER AND ORGANIZER OF THE UNITED STATES BUREAU OF  
FISHERIES

Commissioner of Fisheries 1871-1887

He devoted his life to the public service and through the application of science to fish culture and the fisheries gave his country world-wide distinction

His coworkers and followers in this field dedicate this tablet on the anniversary of the establishment of the Federal fishery service

February 9, 1916

The meeting was presided over by the Commissioner of Fisheries; an address on "Personal Reminiscences" was delivered by Dr. William H. Dall, author of a notable life of Prof. Baird; Prof. Edwin Linton, a special investigator for the Bureau under Prof. Baird and subsequent commissioners, spoke on "The Man of Science and the Public: An Appreciation of Spencer Fullerton Baird," and presented the memorial tablet to the Department of Commerce on behalf of the donors; Vinal N. Edwards, the senior employee of the Bureau, who had been associated with Prof. Baird at Woods Hole since the very inception of the service, unveiled the tablet; and Hon. Edwin F. Sweet, Assistant Secretary of Commerce, in an able address, accepted the tablet on behalf of the Department. The tablet was subsequently set in a conspicuous place in the wall of the building of the Bureau of Fisheries.

The Bureau long ago passed the critical period of its existence and became one of the great Federal instrumentalities for public good. During the last year its already highly varied functions, to which Congress has added from time to time, have been extended; new achievements of permanent importance in behalf of the fisheries, fishermen, and fish consumers are to be recorded; increased appreciation by the general public of the value of the work is to be noted; and plans for still further usefulness have been perfected.

The executive staff at headquarters at the beginning of the fiscal year consisted of H. F. Moore, Deputy Commissioner; Irving H. Dunlap, assistant in charge of office; Robert S. Johnson, assistant in charge of fish culture; Robert E. Coker, assistant in charge of inquiry respecting food fishes and the fishing grounds; Alvin B. Alexander, assistant in charge of statistics and methods of the fisheries; and Ward T. Bower, chief agent of the Alaska service. The Bureau suffered a severe loss by the death, on March 17, 1916, of Mr. Johnson, who had been chief of the fish-cultural work since 1909 and an efficient and loyal employee in that branch of the service since 1881. He was succeeded by Henry O'Malley, who has been an employee in the division of fish culture since 1897 and field superintendent in charge of Pacific-coast operations since 1913. No other change among the administrative staff occurred during the year. To the foregoing officers, to superintendents and directors of stations and laboratories, to the captains of vessels, and cars, to the agents in charge of remote seal islands, and to the great body of subordinates of all capacities on land and sea through whom the real work of the Bureau is accomplished the Commissioner desires to express thanks and commendation for arduous duties faithfully performed, which made the fiscal year 1916 the most noteworthy in the history of the Federal fishery service.

## THE PROPAGATION AND DISTRIBUTION OF FOOD FISHES.

### GENERAL EXTENT AND IMPORTANCE.

Continued progress has been made in fish culture, and the fiscal year 1916 was in general the most successful in the Bureau's history. The distribution of fish and fish eggs shows an increase of 558,504,762 over the preceding year and reached the enormous total of 4,847,262,566. Large increases over the previous year were effected in the propagation of some species, while with others less success was attained. What is

regarded as the most substantial gain, however, is the increase, amounting to 47 per cent, in the number of fingerlings produced and distributed. The policy of rearing larger numbers of young fish to advanced sizes was inaugurated a few years ago and has since been assiduously followed in various fields, to the gratification of those most familiar with fish-cultural methods and needs.

The following table shows by species the number of fish and fish eggs distributed during the fiscal year 1916 from the various stations of the Bureau:

SUMMARY, BY SPECIES, OF THE DISTRIBUTION OF FISH AND EGGS DURING THE FISCAL YEAR ENDED JUNE 30, 1916.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Catfish.....			2,545,777	2,545,777
Carp.....			4,336,832	4,336,832
Buffalofish.....			563,815	563,815
Shad.....	1,097,000	77,644,545		78,741,545
Alewife.....		200,000		200,000
Whitefish.....	74,180,000	316,975,000		391,155,000
Lake herring.....		76,000,000		76,000,000
Silver salmon.....	198,500	8,684,334	1,469,507	10,352,341
Chinook salmon.....	20,622,340	57,250,714	22,982,655	100,855,709
Blueback salmon.....	3,000,000	57,964,920	32,442,748	93,407,668
Humpback salmon.....		19,179,124	3,144,584	22,323,708
Dog salmon.....		21,500,944	1,000,000	22,500,944
Steelhead trout.....	1,079,000	870,600	3,811,058	5,760,658
Rainbow trout.....	1,489,900	243,800	2,831,747	4,565,447
Atlantic salmon.....		1,709,815		1,709,815
Landlocked salmon.....	486,000	357,968	105,777	949,745
Scotch sea trout.....			509	509
Blackspotted trout.....	1,427,000	1,370,310	2,481,228	5,278,538
Loch Leven trout.....			105,500	105,500
Lake trout.....	7,326,054	36,414,323	278,100	44,018,477
Brook trout.....	635,000	5,057,650	7,576,817	13,269,467
Grayling.....	3,500,000	1,868,000		5,368,000
Smelt.....	36,000,000	15,000,000		51,000,000
Mackerel.....		1,946,000		1,946,000
Butterfish.....		392,000		392,000
Crappie.....			3,122,332	3,122,332
Rock bass.....			165,149	165,149
Smallmouth black bass.....		762,710	65,169	827,879
Largemouth black bass.....		471,300	1,357,768	1,829,068
Sunfish.....		33,000	1,635,881	1,668,881
Pike and pickerel.....			43,436	43,436
Pike perch.....	222,160,000	214,533,280	3,460	436,696,740
Yellow perch.....	27,500,000	195,491,000	183,111	223,174,111
Striped bass.....		10,071,000		10,071,000
White perch.....	25,000,000	97,350,000		122,350,000
White bass.....			4,950	4,950
Cod.....		318,681,000		318,681,000
Pollock.....		1,107,460,000		1,107,460,000
Haddock.....		22,170,000		22,170,000
Flatfish.....		1,532,947,000		1,532,947,000
Lobster.....		128,700,000	3,525	128,703,525
Total.....	425,700,794	4,329,300,337	92,261,435	4,847,262,566

Food and game fishes were distributed in every State and Territory in the Union. The marine, Great Lakes, and anadromous species of the eastern and western coasts were practically all liberated in the waters from which the eggs were collected, and the trouts, basses, sunfishes, and other species of the interior were either consigned to inland public waters or contributed as brood stock to privately owned ponds. More than 10,000 individual applications for fish were received, and about the same number was acted on by the consignment of suitable species.

The distribution of the output of the hatcheries at the most suitable ages and in the most economical and effective manner is a highly important branch of fish culture. The regular field equipment and staff provided for this purpose are supplemented by the detail of station employees and the use of public and private carriers, and throughout the year a large part of the fish-cultural personnel was constantly engaged in making deliveries of fish to applicants. The six railway cars specially equipped for the safe transportation of live fish of all ages were in active service at all seasons. They were hauled 149,781 miles, and, in addition, the detached messengers traveled 645,721 miles, carrying their loads of living freight. The increase in the mileage over 1915 was about 25 per cent. The policy of the various railroads differs in the matter of the treatment of fish cars and messengers. Some lines charge full rates for cars with their crews and messengers with their cans, some give substantial reductions from regular fares, and some accord free passage and hauling. In 1916 about 10½ per cent of the travel by cars and 19 per cent of the travel by messengers were furnished gratis.

The first all-steel transportation car, authorized by Congress in the appropriation act for 1915, has been completed and placed in commission. An appropriation of \$40,000 for two additional cars of the same type has been made, but the increase in the cost of labor and materials renders it impossible to secure fully equipped cars within the limits of the sum provided. At the coming session Congress will be asked to appropriate the additional amount required.

The unit cost of fish-cultural operations continues to decrease and in 1916 was reduced to \$117.86 per million fish produced and planted. This is to be compared with \$131.65 in 1915, \$146.36 in 1910, and \$239 in 1905.

#### HATCHERIES OPERATED.

The hatcheries fall naturally into five categories, and their output in 1916 may be classified and summarized as follows:

Marine species of the Atlantic coast.....	3, 112, 299, 525
Migratory species of the Atlantic coast.....	<sup>a</sup> 442, 472, 788
Fishes of the Great Lakes.....	947, 870, 217
Migratory fishes of the Pacific coast.....	248, 975, 220
Fishes of the interior waters.....	95, 644, 816
Total.....	4, 847, 262, 566

The only new permanent hatchery opened in 1916 was the one at Saratoga, Wyo., which has begun operations under favorable auspices and gives promise of great usefulness. This station and the one at Orangeburg, S. C., were not given the full amount of money necessary for entire completion, and Congress will, therefore, be asked to provide the additional sums required.

Under the general authority to establish field stations, operations have been so successful on the Quinault River in Washington and the Klamath River in California that the construction of permanent hatcheries in these localities is warranted.

There follows a list of the hatcheries maintained in 1916, with auxiliary and field stations thereunder, the period of operation, and the species handled. The principal stations, arranged in alphabetical

<sup>a</sup> Includes humpback salmon planted in Maine waters.

order, have a permanent personnel provided by law or are operated more or less independently, although the subsidiary establishments in some cases are fully equipped and quite as important as the head stations to which they are attached for convenience of administration. Some shifting of auxiliary points of operation occurs each year, and, as promising collecting locations are found, the field is expanded to such extent as the available appropriations will allow. There has been no increase in such funds for several years past, hence the extension of work has not been all that was desired or all that the needs of the various fields demand, and new work has been made possible only as the cost of production has decreased by reason of the greater experience and efficiency of the personnel.

## FISH-CULTURAL STATIONS OPERATED DURING THE FISCAL YEAR 1916.

Designation.	Period of operation.	Species handled.
Afognak, Alaska.....	Entire year.....	Blueback and humpback salmons.
Uganik Bay, Alaska.....	June-October.....	Blueback salmon.
Seal Harbor, Alaska.....	do.....	Do.
Baird, Cal.....	Entire year.....	Brook and rainbow trouts and chinook salmon.
Battle Creek, Cal.....	December-April.....	Chinook salmon.
Hornbrook, Cal.....	October-May.....	Chinook and silver salmons.
Mill Creek, Cal.....	December-April.....	Chinook salmon.
Baker Lake, Wash.....	Entire year.....	Blueback and silver salmons.
Birdsview, Wash.....	do.....	Blueback, chinook, humpback, and silver salmons; blackspotted and steelhead trouts.
Brinnon, Wash.....	October-June.....	Dog and silver salmons and steelhead trout.
Darrington, Wash.....	October-April.....	Chinook, dog, humpback, and silver salmons.
Day Creek, Wash.....	September-June.....	Humpback and silver salmons.
Duckabush, Wash.....	do.....	Chinook, dog, humpback, and silver salmons; and steelhead trout.
Ellabott Creek, Wash.....	do.....	Chinook, humpback, and silver salmons.
Quilcene, Wash.....	do.....	Chinook, dog, humpback, and silver salmons.
Sultan, Wash.....	do.....	Chinook, humpback, and silver salmons, and steelhead trout.
Battery, Md.....	April-May.....	Shad, white perch, and yellow perch.
Boothbay Harbor, Me.....	Entire year.....	Cod, flatfish, pollock, and lobster.
Portland, Me.....	July-October; May-June.....	Lobster.
Bozeman, Mont.....	Entire year.....	Blackspotted, brook, rainbow, and steelhead trouts, and grayling.
O'Dell Creek, Mont.....	March-May.....	Grayling.
Meadow Creek, Mont.....	do.....	Grayling and rainbow trout.
Yellowstone, Wyo.....	July-June.....	Blackspotted trout.
Clear Creek, Wyo.....	do.....	Do.
Columbine Creek, Wyo.....	do.....	Do.
Cub Creek, Wyo.....	do.....	Do.
Lake Camp, Wyo.....	do.....	Do.
Bryans Point, Md.....	March-May.....	Shad and yellow perch.
Cape Vincent, N. Y.....	Entire year.....	Brook, lake, and rainbow trouts; lake herring; landlocked salmon; pike perch; yellow perch; and whitefish.
Amherst Island, N. Y.....	October-November.....	Lake trout.
Charley Shoals, N. Y.....	do.....	Lake trout and whitefish.
Horseshoe Island, N. Y.....	do.....	Lake trout.
Ogdensburg, N. Y.....	April-May.....	Pike perch.
Old Forge, N. Y.....	November.....	Whitefish.
Pigeon Island, N. Y.....	October-November.....	Lake trout.
Pope Mills, N. Y.....	April.....	Pike perch.
Sodus Point, N. Y.....	November-December.....	Lake herring.
Stony Island, N. Y.....	November.....	Lake trout.
Three Mile Bay, N. Y.....	November-December.....	Lake herring and whitefish.
Central Station, Washington, D. C.....	Entire year.....	Shad, pike perch, and yellow perch.
Clackamas, Oreg.....	do.....	Chinook salmon, and brook, rainbow, and steelhead trouts.
Applegate, Oreg.....	April-June.....	Chinook and silver salmons, and rainbow and steelhead trouts.
Big White Salmon, Wash.....	October-May.....	Chinook salmon.
Little White Salmon, Wash.....	do.....	Do.
Rogue River, Oreg.....	Entire year.....	Blackspotted and steelhead trouts and chinook and silver salmons.
Upper Clackamas, Oreg.....	do.....	Chinook salmon and steelhead trout.
Willamette, Oreg.....	July-June.....	Shad.

## FISH-CULTURAL STATIONS OPERATED DURING THE FISCAL YEAR 1916—Continued.

Designation.	Period of operation.	Species handled.
Cold Springs, Ga.....	Entire year.....	Black bass, catfish, sunfish, and war-mouth bass.
Milltown, Ga.....	April-June.....	Black bass.
Craig Brook, Me.....	Entire year.....	Atlantic salmon, brook and Scotch sea trout, and humpback salmon.
Upper Penobscot, Me.....	April-May.....	Atlantic salmon.
Duluth, Minn.....	Entire year.....	Brook, lake, and steelhead trouts, pike perch, and whitefish.
Grand Marais, Minn.....	October-November.....	Lake trout.
Edenton, N. C.....	Entire year.....	Black bass, rock bass, shad, sunfish, and white perch.
Weldon, N. C.....	April-May.....	Striped bass.
Erwin, Tenn.....	Entire year.....	Brook and rainbow trouts, large and small mouth black basses, rock bass, carp, and sunfish.
Gloucester, Mass.....	.....do.....	Cod, flatfish, haddock, pollock, mackerel, and lobster.
Green Lake, Me.....	.....do.....	Brook and lake trouts, humpback and landlocked salmon, and smelt.
Grand Lake Stream, Me.....	.....do.....	Landlocked salmon.
Homer, Minn.....	.....do.....	Black bass, buffalofish, carp, catfish, crappie, pike, pike perch, rock bass, sunfish, and yellow perch.
La Crosse, Wis.....	.....do.....	Black bass, buffalofish, carp, catfish, crappie, pike, pike perch, sunfish, yellow perch, and brook and rainbow trouts.
Leadville, Colo.....	.....do.....	Blackspotted, brook, lake, and rainbow trouts.
Antero Reservoir, Colo.....	April-May.....	Rainbow trout.
Cheesman Lake, Colo.....	.....do.....	Do.
Edith Lake, Colo.....	October-November.....	Brook trout.
Engelbrechts Lake, Colo.....	.....do.....	Do.
Hosselkus Lake, Colo.....	.....do.....	Do.
Kelleys Lake, Colo.....	.....do.....	Do.
Musgrove Lake, Colo.....	.....do.....	Do.
Smiths Ponds, Colo.....	.....do.....	Do.
Northfield Lake, Colo.....	.....do.....	Do.
Turquoise Lake, Colo.....	.....do.....	Do.
Woodland Park, Colo.....	.....do.....	Do.
Louisville, Ky.....	Entire year.....	Large and small mouth black basses, rock bass, sunfish, and rainbow trout.
Mammoth Spring, Ark.....	.....do.....	Large and small mouth black basses, catfish, rock bass, and sunfish.
Friars Point, Miss.....	July-December.....	Black bass, buffalofish, carp, catfish, crappie, and sunfish.
Manchester, Iowa.....	Entire year.....	Brook and rainbow trouts, pike perch, rock bass, and sunfish.
Bellevue, Iowa.....	August-December.....	Black bass, buffalofish, carp, catfish, crappie, pike, sunfish, white bass, and yellow perch.
North McGregor, Iowa.....	.....do.....	Black bass, carp, catfish, buffalofish, crappie, pike, sunfish, and yellow perch.
Nashua, N. H.....	Entire year.....	Brook and rainbow trouts, catfish, and smallmouth black bass.
Neosho, Mo.....	.....do.....	Black bass, catfish, crappie, rainbow trout, rock bass, smallmouth black bass, sunfish, and yellow perch.
Northville, Mich.....	.....do.....	Brook, lake, and rainbow trouts, grayling, and smallmouth black bass.
Alden, Mich.....	November.....	Whitefish.
Alpena, Mich.....	April-May.....	Lake trout and whitefish.
Antrim City, Mich.....	November.....	Whitefish.
Bay City, Mich.....	April.....	Pike perch.
Bay Port, Mich.....	November.....	Whitefish.
Belle Isle, Mich.....	October-November.....	Do.
Charity Island, Mich.....	.....do.....	Do.
Charlevoix, Mich.....	April, May, December.....	Lake trout and whitefish.
Detour, Mich.....	October-November.....	Lake trout.
Detroit, Mich.....	April, May, December.....	Pike perch and whitefish.
Fairport, Mich.....	October-November.....	Lake trout.
Frankfort, Mich.....	.....do.....	Do.
Grassy Island, Mich.....	.....do.....	Lake trout and whitefish.
Isle Royal, Mich.....	.....do.....	Do.
Kewauunaw Point, Mich.....	.....do.....	Lake trout.
Manistique, Mich.....	.....do.....	Do.
Marquette, Mich.....	.....do.....	Lake trout and lake herring.
Monroe, Mich.....	April and November.....	Pike perch and whitefish.
Munising, Mich.....	October-November.....	Lake trout.
Munoscog, Mich.....	April.....	Pike perch.
Naubinway, Mich.....	November-December.....	Whitefish.
Ontonagon, Mich.....	October-November.....	Lake trout.



## FISH-CULTURAL STATIONS OPERATED DURING THE FISCAL YEAR 1916—Continued.

Designation.	Period of operation.	Species handled.
Northville, Mich.—Continued.		
St. James, Mich.....	October-December.....	Lake trout and whitefish.
Sault Ste. Marie, Mich.....	do.....	Do.
Jacobsville, Mich.....	October-November.....	Lake trout.
Orangeburg, S. C.....	Entire year.....	Black bass and shad.
Put in Bay, Ohio.....	do.....	Pike perch, whitefish, and yellow perch.
Kellys Island, Ohio.....	November-December.....	Whitefish.
Middle Bass, Ohio.....	do.....	Do.
North Bass, Ohio.....	April and November.....	Pike perch and whitefish.
Port Clinton, Ohio.....	do.....	Do.
Toledo, Ohio.....	do.....	Do.
Quinault, Wash.....	Entire year.....	Blueback, chinook, and silver salmon.
Quincy, Ill.....	do.....	Black bass, carp, catfish, crappie, pike perch, sunfish, and yellow perch.
St. Johnsbury, Vt.....	do.....	Brook, lake, rainbow, and steelhead trout, landlocked salmon, smallmouth black bass, and yellow perch.
Darling Pond, Vt.....	August-December.....	Brook trout.
Holden, Vt.....	Entire year.....	Brook, lake, rainbow, and steelhead trout, and landlocked salmon.
Lake Mitchell, Vt.....	August-December.....	Brook trout.
Swanton, Vt.....	March-June.....	Pike perch and yellow perch.
San Marcos, Tex.....	Entire year.....	Black bass, crappie, rock bass, sunfish, and warmouth bass.
Saratoga, Wyo.....	do.....	Brook trout.
Spearsfish, S. Dak.....	do.....	Blackspotted, brook, lake, Loch Leven, rainbow, and steelhead trout.
Tupelo, Miss.....	do.....	Black bass, crappie, and sunfish.
White Sulphur Springs, W. Va.....	do.....	Brook and rainbow trout, large and small mouth black basses.
Woods Hole, Mass.....	do.....	Cod and flatfish.
Menemsha, Mass.....	January-April.....	Flatfish.
Waquoit, Mass.....	do.....	Do.
Wickford, R. I.....	do.....	Do.
Wytheville, Va.....	Entire year.....	Brook and rainbow trout, large and small mouth black basses, landlocked salmon, rock bass, and sunfish.
Yeo Bay, Alaska.....	do.....	Blueback and humpback salmon.
Eagle Lake, Alaska.....	June.....	Blueback salmon.
Ketchikan, Alaska.....	September-October.....	Humpback salmon.

## PACIFIC SALMON CULTURE.

The artificial propagation of the Pacific salmon in the three coast States and Alaska attained greater efficiency and magnitude in 1916 than in any previous year. Shortage in the egg-take at some points was more than compensated for by a high degree of success elsewhere, and the output, in round numbers, was 250,000,000 fish, compared with 225,000,000 in 1915. The most satisfactory feature of this increase was that it was made up largely of chinook and sockeye, or blueback, salmon, the most valuable of the five Pacific salmon. Humpback salmon also were produced in larger numbers, but the output of silver and dog salmon, owing to various local difficulties encountered during the spawning season, fell behind last year's record.

In pursuance of the recently adopted policy of increasing each season so far as possible the output of fingerling salmon, the rearing facilities at the Pacific stations were sufficiently enlarged during the year to permit of the production of 61,039,494 fingerling fish. This number represents about 24½ per cent of the total salmon output in 1916 and shows an increase of more than 100 per cent over the output of fingerling salmon the previous year.

The abnormal physical conditions resulting from the eruption of Mount Katmai in 1912 have now become so ameliorated that they are expected to cause no further difficulty in connection with the fish-

cultural work at the Afognak station. However, the past season was remarkable because of an extended drouth, which at one time during the early winter became so acute that it was feared it would be necessary to plant all eggs and fry in the hatchery in order to save them. In July, 1915, when the run of blueback salmon appeared in Letnik Bay, the water in the river and lake near the station was so low that but comparatively few fish succeeded in ascending, and of those which did reach the lake a large proportion died in the shallow tributaries before ripening. The eggs of others hardened in the fish, and, altogether, considerable numbers of eggs were thus lost to the station. Notwithstanding these unfavorable conditions, the collections exceeded last year's take by a small margin and gave evidence of the zealous efforts of the hatchery force.

In addition to 6,353,000 blueback and 11,435,000 humpback eggs taken at the main station, 5,773,000 blueback and 3,523,800 humpback eggs were secured at the recently established field stations at Seal Bay and Uganik. This stock was enlarged during the early winter by the transfer from the Yes Bay station of 15,000,000 blueback eggs, which, notwithstanding the 15 days consumed in effecting the transfer, were found on arrival to be of very good quality. Besides the difficulty experienced with a short water supply, the winter was intensely severe, and the prevailing low water temperatures so retarded the incubation period that the last of the eggs were not hatched until May 29. Despite the unfavorable circumstances contended with, however, 24,513,700 blueback and 13,104,200 humpback salmon fry were hatched, and 11,169,440 of the bluebacks were carried through to the fingerling stage in good condition. All of the young humpbacks had to be liberated shortly after hatching in order to provide sufficient water for handling the fry of the more valuable species.

All the fish on hand at the Afognak station in the course of the year were free from fungus or disease with the exception of those derived from the Uganik field, a considerable number of which developed a white spot about midway of the umbilical sac near the notochord. The fry thus marked died at the end of the fifth or sixth day. The spot was discernible in the egg from 10 to 15 days before hatching, but could not be seen previous to that time with the unaided eye. So far as known, no trouble of this nature has ever before been experienced at the Afognak station.

The salmon season at the Yes Bay station was remarkable both for the unusually large number of eggs secured and for the peculiarity in the run of fish. As a rule, brood salmon enter the lake in the vicinity of the station from one to two months before they are ready to spawn, but this year close observation up to the beginning of the spawning season failed to reveal any large numbers, and it was feared that few eggs would be available. The first bluebacks were taken September 2, and the spawning season was well advanced before any material increase in the numbers of fish could be discerned. Daily collections of eggs were continued to September 29, by which date 72,000,000—representing the total capacity of the hatchery—had been taken, and, while large numbers of spawning fish were still accessible, the collections had to be discontinued.

As the incubation period advanced, the congested condition of the hatchery was relieved by the transfer of 15,000,000 eggs to the Afognak station and 3,000,000 to the Oregon State Fish Commission.

The remainder were carried through to the hatching stage with a loss of only 2 per cent. Because of inadequate hatchery room, it was impossible to carry all of the fry, and frequent plantings had to be made in order to prevent congestion in the troughs. The absorption of the yolk sac was completed in May and feeding began the last of that month. Spent blueback salmon, salted and preserved in barrels, were utilized as food for the young fish. A meat chopper for grinding this food was set up in the dynamo room and operated with power from the dynamo turbine. Last year the salted salmon was cooked, pressed, and grated, and a meal thus obtained, and while the fingerlings thrived on it at first, their growth appeared to be arrested later and heavy mortality ensued. Whether this was due to the condition of the food or to the high temperature of the water during the period of feeding could not be determined, but in 1916 the salted salmon was freshened and ground but not cooked and better results were attained.

The substation established the previous year on Ketchikan Creek for the collection of eggs of the humpback salmon was again opened for operations, but very early in the season protests against the work were made by the citizens of Ketchikan and it was decided to abandon it. At that time only 325,000 eggs had been taken, and as the expense of carrying them until hatched would have been considerable they were deposited in the gravel of the creek where collected. A search was then instituted for a new site, and it is believed a very good one has been found on Smeaton Bay about 6 miles from the Behm Canal, where experimental work will be continued next season.

In addition to the transfers of eggs already mentioned, the output from the Yes Bay station comprised 32,920,000 fry and 20,876,000 fingerlings, and at the close of the year 650,000 fingerlings were being retained for later distribution.

At the Baker Lake station, in Washington, the work of capturing a brood stock of blueback salmon was undertaken early in July, and by the close of the collecting period 9,127 fish in good condition had been secured and placed in the slough at the head of Baker Lake to ripen. Various repairs had just been made to this inclosure to insure the safety of the impounded fish, but, despite the precautions taken, a large number of them escaped in October during a period of continuous rainfall which raised the level of the lake fully 15 feet. It is estimated that the egg collections, which amounted to 3,111,000, were at least 7,000,000 short of what they would have been had the loss of fish not occurred. In addition to this work, eggs of the chinook salmon, silver salmon, and steelhead trout, aggregating 504,200, were taken and hatched and the fry were planted locally. The output of blueback-salmon fry from Baker Lake station numbered 1,875,000, and 732,379 were still on hand at the close of the year. In the course of the year a new hatchery and barn were constructed, various improvements were made to the cottage and mess house, and a fire-service pipe line was laid.

From the Birdsvew station there were distributed early in the year 620,280 blackspotted and steelhead trout fry and also fingerling, chinooks, and blueback salmons aggregating nearly 344,000, all of which had been carried over from the previous fiscal year. The run of humpback salmon in streams in the vicinity of the Birdsvew sta-

tion began early in September, but owing to the low water it was very light as compared with former years. The total humpback-egg collections amounted to 1,550,000, all of which, with the exception of 30,000 forwarded for exhibit at San Francisco, were used in making up a shipment of 7,000,000 eggs destined for New England stations, the balance of the consignment being contributed by other Washington stations. In addition to the humpback collections, 149,000 chinook-salmon eggs were taken during the fall, 1,238,000 silver-salmon eggs during the fall and winter, and 3,212,000 steelhead-trout eggs in the spring, the last take being the largest for several years.

At the Illabot Creek substation, where the run of humpback and chinook salmon was interfered with by low water, egg collections of the former numbered 2,500,000 and of the latter nearly 4,000,000. Later on the chum eggs were lost, the water in the flume and hatching troughs freezing solidly during a spell of very cold weather, despite the efforts put forth to save them. Silver-salmon egg collections were disappointing here as elsewhere, only 44,000 being taken.

Egg collections at the Puget Sound stations amounted, in round numbers, to 39,000,000, of which about 25,000,000 were of the chum, or dog, salmon, over 3,500,000 of the humpback, 7,000,000 of the silver, a little over 500,000 of the chinook, and about 3,000,000 of the steelhead trout. Plantings of fry of the various species named aggregated nearly 34,000,000. The run of humpback salmon here, as elsewhere in Washington, was light, the lack of the usual abundance of fresh water in the sound basin apparently causing the main body of the run to seek more northerly streams.

At Duckabush the pond system was completed during the year and a battery of 32 eyeing troughs was installed. In connection with the work at Quilcene a convenient slough near the station was converted into a nursery pond with a capacity for 2,000,000 fry, and an eyeing plant, consisting of a battery of 24 troughs, was constructed in the close vicinity of the trap where the fish were taken, thus obviating the loss and expense heretofore involved in the transportation of the green eggs 2 miles to the hatching station.

In advance of the blueback season in the Quinault region a battery of 86 troughs was installed in a new building 40 by 77 feet in dimensions and supplied with water from a new flume, and by October 10, when the run of salmon made its appearance, racks and traps had been built in three creeks emptying into Quinault Lake and River and everything was in readiness for the collection of eggs, which began three days later. From that time on collections were made daily until December 18, on which date, the hatchery being filled, the racks were withdrawn and a considerable number of unspawned fish was set free.

Two kinds of apparatus were used to capture the fish, namely, upstream traps and seines, the latter being employed in deep holes in the creeks and in the upper part of the river. In some of the seine hauls as many as a thousand fish, nearly all of them ripe, were taken at a time. The run was said by the native Indians to be the largest ever known in that region. The 18,000,000 eggs constituting the season's take were transferred by station launch to the field hatchery, and, notwithstanding the intensely cold weather encountered during the winter—the ice formation on the hatchery floor being at one time 6 inches thick—they were of such excellent quality as to pro-

duce 91 per cent of fry. A consignment of 50,000 blueback-salmon eggs from the Yes Bay collections was transferred to this station during the fall with the view of utilizing the young fish hatched therefrom in marking experiments.

From the entire stock on hand 16,580,946 vigorous fry were produced, most of which, owing to lack of rearing facilities, had to be liberated before the absorption of the yolk sac. Incidental to the work with this species, small numbers of eggs of the chinook and silver salmon were taken, hatched, and distributed, the output of fry from both lots amounting to 135,924.

Coming now to the Oregon field, it may be noted that for the first time in some years all natural conditions on the Clackamas River were favorable for chinook-salmon work, and during the spawning season, which extended from September 23 to November 17, eggs in excess of 10,000,000 were collected, the take being nearly two and a half times larger than in the previous year. Two millions of these were transferred to the upper Clackamas hatchery with the view of rearing the resulting fry and planting them in the headwaters of that river. Of those hatched at Clackamas station, 2,500,000 were planted on the absorption of the food sac and the remaining 1,500,000 were fed until April and then liberated, both lots being returned to the spawning grounds from which the eggs were secured. As at the other Pacific stations, the principal food used was the flesh of salted salmon, 8 tons of which had been prepared in advance.

Fishing operations on the upper Clackamas were almost impracticable, owing to the absence of slack water at the foot of the fishway dam, and while there was a fair run of salmon in sight only 24,000 eggs were secured.

The collection of chinook eggs on tributaries of the Columbia River amounted to nearly 50,000,000, over two-thirds of them being taken on the Little White Salmon River. As the station on that stream is equipped for handling only about 25,000,000 eggs, the surplus of 9,000,000 was utilized in fully stocking the hatchery on the Big White Salmon, where collections of 13,200,000 eggs had been made. The eggs at both points were hatched with normal losses, and the combined output aggregated 43,822,000 fish, of which 6,670,665 were fingerlings.

Nearly 6,000,000 chinook eggs were taken at the Rogue River station, and 1,000,000 of these were supplied to the Oregon State Fish Commission. From the remainder there was an output of 1,952,000 fry and 1,550,037 fingerling fish. Steelhead-trout eggs to the number of 405,700 were collected from this river during the spring, and more would have been secured had not the high water permitted many of the impounded fish to escape. Of the cutthroat trout, which ran with the steelheads, a few fish were secured that yielded 23,000 eggs.

On the tributary stream at Applegate Creek 601,000 chinook and 782,500 silver-salmon eggs were obtained and handled with the usual mortality, and during the spring 4,148,000 steelhead eggs were taken. In the operations with this latter species very successful use was made of a section of irrigation ditch for impounding partly ripe fish, permission having first been obtained from the owners of the property. In connection with the work at this point a small number of

Lake Tahoe trout fry belonging to the Oregon State Fish Commission were held, fed, and at length liberated in Crater Creek.

The hatching of shad on a minor scale has been continued in the Columbia basin. During the early part of the fiscal year 317,445 eggs on hand July 1 were hatched and the fry were liberated on the spawning grounds in the Willamette River. Near the close of the year shad-egg collections were again made, and by the last of June nearly 3,000,000 fry had been hatched and planted.

The chinook-egg collections in the California field were about 7,000,000 behind those of the previous year, the shortage being due partly to failure to obtain eggs on the McCloud River and partly to unfavorable water stages during the spawning season at both the Mill Creek and the Battle Creek stations. The streams on which these stations are located were so low during the first part of the season that the fish could not ascend, and the heavy rains occurring later resulted in floods which damaged the racks and put an end to the work by allowing all fish held below them to escape.

At the Baird station shortage of funds made it impossible to install the racks in the McCloud River at the usual time during the spring, and before their completion in July the major portion of the run of salmon had passed upstream. The egg collections at the two auxiliary stations referred to aggregated only 26,747,000, but the shortage as compared with last year was largely overcome by the unexpected success attained at the Hornbrook substation, where 16,460,000 chinook eggs were secured from the Klamath River besides eggs of the silver salmon to the number of 2,823,000. While the facilities at Hornbrook had only recently been enlarged, the hatching capacity of the station is still far too small to permit of the handling of such numbers. It was, therefore, arranged to have the State fishery authorities develop the surplus eggs at the Sisson hatchery and return the fry by means of the State fish car for liberation on the spawning grounds in the Klamath River. All of the silver-salmon eggs were hatched at the point of collection and the fry were returned to the river without feeding.

The salmon output from the Battle Creek and Mill Creek stations consisted of 9,505,000 fry and 12,373,224 fingerlings. Attempts were made in April to collect eggs of the rainbow trout in Cottonwood Creek, a tributary of the Klamath, but for some unknown reason the usual run of fish in this stream failed to make its appearance and only 26,640 eggs were obtained. These were transferred to the Baird station to be hatched, and the fry were utilized in supplying California applicants.

#### PROPAGATION OF MIGRATORY FISHES OF ATLANTIC STREAMS.

This branch of the fish-cultural work is addressed to the shad, Atlantic salmon, striped bass, white perch, and yellow perch.

Contrary to the experience of recent years, the shad season on the Potomac River was comparatively successful from the viewpoint of artificial propagation as well as in financial returns to the commercial fishermen, whose catch was estimated to be fully 50 per cent greater than in any previous year since 1896. The fish appeared on the spawning grounds in plentiful numbers shortly after the middle of April, but for about 15 days thereafter the water temperatures were



too low for the ripening of the eggs. During the latter half of the season, however, favorable conditions prevailed and 63,815,000 eggs were secured. These were hatched at the station, with the exception of 2,076,000 shipped on assignments, and the resulting fry—58,232,700 in number—were widely distributed on the natural spawning grounds in the Potomac River.

The satisfactory outcome of the shad season on this river, in strong contrast with the failures in recent years, is to be attributed, in part, to the restrictions imposed by the War Department on the pound-net fishermen operating in Chesapeake Bay and at the mouths of the tributary rivers. Definite lanes for navigation have been kept open, and the migrating schools have thus had a clearer passage than heretofore to their spawning grounds in the upper part of the stream. The large run in 1916 may be attributed also to the favorable conditions for spawning four years before, when extensive egg collections were made.

In advance of the shad season on the Potomac, 16,013 adult yellow perch were collected from the fishermen's nets and placed in live cars. Here they began spawning at once and between March 29 and April 7 produced 152,235,000 eggs. Of these, 3,640,000 were used for exhibition purposes at Central Station, Washington, D. C., and from the remainder 137,101,000 excellent fry were hatched, all of which were planted in fine condition in tributary streams of the Potomac River, extending from Broad Creek, Md., to Occoquan Creek, Va., this territory comprising the principal breeding ground of the species.

The shad operations on the Susquehanna River were attended by the usual discouraging results. On this river a specially destructive fishing device—the anchored gill net—is in extensive use at the present time, to the almost total exclusion of the drift net, from which eggs of good quality have always been derived. In practice the anchored net is allowed to remain in position throughout the night, and on being lifted in the morning nearly all the shad with ripe eggs are found in a mutilated condition, having been preyed upon by eels.

The spring's work on the Susquehanna included the collecting of 67,512,000 yellow-perch eggs, 153,700,000 white-perch eggs, and 6,583,000 shad eggs. Eggs of the first-named species were obtained between April 3 and April 10, and the station output comprised 25,500,000 eggs shipped on assignment, besides 33,400,000 fry. The white-perch season extended from April 15 to the end of that month. Of the eggs secured, 25,000,000 were supplied to applicants and the remainder produced 96,500,000 fry. The first shad eggs were taken April 19, and while the fishing season was long drawn out, extending far into June, eggs came into the hatchery in such small lots that it was deemed advisable on May 13 to discontinue this work, and the station was closed shortly afterwards.

In Albemarle Sound slightly over 16,000,000 shad eggs constituted the season's collections, making it one of the poorest experienced since the establishment of the Bureau's station in that region. While the unfavorable showing was due in some measure to the cold northerly winds which prevailed throughout the spawning period, it is yearly becoming more evident that the Bureau's efforts to maintain the shad fisheries of Albemarle Sound are not appreciated by all those who are deriving most of the benefit therefrom. The gill-net

fishermen, to whose cooperation the Bureau is indebted for the successful shad work in recent years, are gradually being driven off the spawning grounds by the encroachments of the pound-net fishermen, who apparently take no interest in the work of artificial shad propagation. The records of the Edenton station show that the number of fishermen—principally gillers—furnishing eggs to the hatchery increased from 31 in 1910 to 67 in 1913, in which year the largest egg collections in the station's history were made. Since that time the operations of the gillers have rapidly declined, and only 17 were left to furnish eggs for the Bureau's work in 1916. The output of fry from the eggs obtained numbered 9,765,000.

Plans were made early in the spring at the Edenton station to undertake the hatching of the white perch, but the efforts to obtain eggs resulted in practical failure, only 1,200,000 being secured. The reason advanced for this poor outcome is the irregularity and uncertainty of the ripening of the fish, a feature which, from all accounts, has always existed in the Albemarle Sound region. The collection of these eggs began in March and extended well into April, and the output of fry was 850,000.

With the view of prosecuting striped-bass work on a more efficient and extensive basis than heretofore, a time lease was secured on a building on the west bank of the Roanoke River, which was fitted up in advance of the spawning season. The opening of the spawning season was delayed by heavy rains in April, but, aside from the shortening of the season by its late beginning, natural conditions were quite favorable and the season proved to be very successful, 13,325,000 eggs being taken and 10,071,000 fry hatched therefrom.

The shad work was extended during the year by the establishment and operation of two auxiliaries of the Orangeburg station on the Edisto River, S. C., and by the opening of an experimental field station on the Cape Fear River in North Carolina.

The spawning season on the Edisto was very short, and just at its height the work was stopped by the State warden, owing to some doubt on his part as to the legality of the fishing methods inaugurated in connection therewith. Before this difficulty could be cleared up and fishing resumed most of the run of shad had passed up the river. But for this interference considerable collections of eggs would, doubtless, have been made, as fish in spawning condition were fairly plentiful. The outcome was that 605,000 eggs were collected for the plant at Jacksonboro and 347,000 for the Branchville auxiliary. The output of fry from these two points amounted to 772,000, which were returned to the Edisto River in the immediate vicinity of the stations.

The shad work on the Cape Fear River was undertaken largely at the request of the State authorities and Members of Congress, in order that the fishermen of that section of the State might receive some recognition for having been brought—very tardily; it must be said—under the provisions of the protective fishery laws that for years had applied to other parts of the State. The steamer *Fish Hawk*, equipped as a floating hatchery, was sent to the river, and a temporary hatching plant was set up at a convenient point on the river bank above Wilmington.

The run of shad on the Cape Fear proved to be small, and of the shad taken at the various fisheries only one individual with ripe eggs

was found by the spawn takers detailed for the work. The material results of this experiment were, therefore, wholly negative, but the experience gained will doubtless be helpful in connection with any future operations which may be considered for that field.

Atlantic salmon operations on the usual scale were conducted at the Craig Brook, Me., station. In June of the previous year a brood stock of 725 fish had been purchased and transferred to the station inclosure until spawning time in October, when 1,953,400 eggs were yielded. Early in the winter consignments of eggs to the number of 1,770,400 were transferred to the subhatchery near the headwaters of the Penobscot River for development, and all of the fry hatched—1,709,815—were liberated in the east branch of that river during May and June, 1916. The fish from which the eggs were derived were liberated immediately after spawning at the head of tidewater in Orland River.

In the spring of 1916 the run of Atlantic salmon in the Penobscot was reported to be the largest since 1912, and no difficulty was experienced in securing 1,031 adults to serve as a brood stock for the coming season, the number exceeding by several hundred the brood stock of the two previous seasons. The sentiment of the local fishermen has undergone an entire change, and they are now anxious to cooperate with the Bureau, whereas in past years many of them have been in doubt as to the value of its work with this species.

#### FISH CULTURE IN THE GREAT LAKES.

While the weather conditions prevailing at the Great Lakes stations during the spawning season of the commercial fishes were not uniformly unfavorable, they seriously handicapped the work in some of the more important fields and caused a reduction of about one-fifth in the collections of lake-trout and whitefish eggs as compared with the previous year. The results of the pike-perch operations were more satisfactory, but the effects of an abnormally cold, late spring are clearly shown by the material shortages in eggs taken and fry planted.

Beginning October 1 arrangements were made for the usual collections of lake-trout eggs in Lake Superior waters, field stations for the purpose being opened at Isle Royale, Marquette, Munising, Ontonagon, Jacobsville, and Keystone, on the Michigan shore, and at Grand Marais, in Minnesota. From these various points 23,070,000 eggs of excellent quality were secured and also 2,668,000 whitefish eggs, all of which were forwarded to the Duluth hatchery for development.

Of the lake-trout eggs 3,509,724 were shipped in the eyed stage to State and private hatcheries, all of the consignments reaching their destinations in excellent condition. The remainder were hatched and 14,390,000 fry were distributed during March and April. A small number of lake-trout fry were held and fed to the fingerling stage. This stock when distributed in early June numbered 211,000.

The small collection of whitefish eggs was supplemented by the transfer of 25,000,000 green eggs to Duluth from the Lake Erie field in December, and from the total stock of that species handled 18,575,000 fine healthy fry were produced and planted in suitable parts of Lake Superior. In April 17,750,000 pike-perch eggs were trans-

ferred to Duluth from collecting points in Lake Huron. These eggs were of exceptionally poor quality and the losses sustained during incubation were far above normal. However, owing to their slow development in intensely cold water, the 3,800,000 fry hatched were of good quality. This stock was utilized in filling applications submitted from North Dakota, Michigan, and Minnesota, the distribution occurring in late May and early June.

In addition to operations with the commercial species, the Duluth station had an output of 376,000 brook trout and 44,500 steelheads, the eggs of the former having been purchased from commercial fish culturists, while those of the latter were transferred from one of the Pacific stations.

In the lake-trout fields covered by the Michigan stations the spawning season opened October 18, a few days in advance of former years, and closed 10 days earlier than usual, shortening the egg-collecting period about one-third as compared with 1914. Owing partly to this fact and partly to unfavorable weather the catch of fish was reduced to almost 50 per cent of a normal take. The prevailing high winds frequently prevented the lifting of the fishermen's nets for periods of five to seven days in succession. As a consequence many of the eggs were of very poor quality, and of the 43,544,000 taken at all points 17,461,800, or 41 per cent, were lost before the eye-spots developed. When sufficiently advanced for shipment, 9,674,200 were forwarded to other Great Lakes stations of the Bureau and to State hatcheries in Wisconsin and Michigan. The output of fry from the balance numbered 16,408,000, all of which were returned to the spawning grounds in Lakes Michigan and Huron, with the exception of 2,000,000. This lot was deposited in Whitefish Bay, an arm of Lake Superior.

The first whitefish eggs for stocking the Michigan stations were taken October 11 at the Charity Island fishery, in Saginaw Bay, and the last on December 20 at Northport, Lake Michigan. In addition to the two points mentioned field stations were maintained at Nautinway, St. James, Antrim City, and Traverse City, and an experimental collecting point was opened at Alden, on Torch Lake, to determine the feasibility of taking whitefish from inland waters in sufficient quantities to warrant the expense. From the knowledge thus gained it is believed the work in this direction can be advantageously extended through next year.

Collections were made as usual in the Detroit River at the Belle Isle fishery, and the old Grassy Island fishery was operated again for the first time since the dredging of the river channel. The results of the work at the latter point demonstrated conclusively that it has been permanently destroyed as a whitefish spawning ground.

As in the lake-trout work, extremely rough weather was encountered during the major portion of the whitefish spawning season, obstructing fishing operations to such an extent that the catch was hardly half that of an average year. Especially poor results were attained at the Charity Island fishery, where the field is so exposed that the nets were either blown out entirely or the high winds made it impossible to lift them for days at a time. In round numbers, the Detroit River fisheries yielded 25,000,000 eggs, the one at Charity Island 18,500,000, and those in upper Lake Michigan 72,500,000.

The supply was further augmented by the transfer of nearly 26,000,000 green eggs to Detroit from the Monroe Piers fishery, in Lake Erie, making a total stock of 141,880,000, of which 116,120,000 were developed to the eyed stage, the losses up to that time amounting to slightly over 18 per cent. When sufficiently advanced for shipment, 90,000,000 eggs were forwarded to the Charlevoix, Alpena, and Sault Ste. Marie subhatcheries, which are in the immediate vicinity of the spawning grounds in the upper lake; 6,120,000 were used to fill applications; and from the remainder 18,500,000 of fry were hatched and planted in the Detroit River.

Pike-perch operations during the spring in Michigan fields were prosecuted under such unfavorable conditions that up to the end of April, when large quantities of ice still covered the most prolific spawning grounds, it was feared that the season would be a total failure. The prospects improved, however, with the disappearance of the ice early in May, and the egg collections at the close of the season amounted to 166,800,000, the majority of which were taken in Saginaw Bay and in Munoscong Bay in the St. Marys River. Permission to operate in the latter field was granted by the Michigan fishery authorities as an experiment, and, as over 70,000,000 eggs were taken, it is hoped the work will be continued in that territory.

While in the green state 18,750,000 pike-perch eggs were transferred to the Duluth station and 12,600,000 to the substation at Sault Ste. Marie, the latter shipment being designed to test the practicability of hatching there the pike-perch fry required for applicants in the upper peninsula of Michigan. The water supply proved too cold, however, and all of the eggs perished. Of the 135,450,000 eggs laid down in the Detroit hatchery, only 44,235,000 survived to the eyed stage, about 32½ per cent of the original number. The fry hatched therefrom were utilized in filling various applications and in stocking public waters where egg collections had been made.

The whitefish spawning season in Lake Erie was attended by several peculiar features. Although the water temperatures of the lake were below the average during the greater part of the summer, no whitefish whatever appeared on the spawning grounds until after the middle of November, and egg collections for the Put in Bay station were possible only from November 18 to December 7, making it one of the shortest spawning seasons on record.

As a rule, when whitefish seek the head of Lake Erie at the approach of the spawning season they congregate upon the reefs and shoals for the deposition of their eggs. In this instance, however, all but a very few remained in the deeper waters. This departure from the usual habit is probably accounted for by the prevailing heavy west winds, which had a tendency to blow the water away from the west end of the lake, making it very shallow and rough on the usual spawning grounds. At Monroe Piers, which in recent years has been one of the best whitefish fields operated by the Bureau, fish were so scarce that only a very few partly ripe ones were available for penning. From penned fish and from collections made directly from the fishermen only 40,720,000 eggs were secured, as against a three-year average of 170,000,000 in the same field.

Taking the work as a whole, however, and making allowance for the short spawning season, the results were quite satisfactory, as,

with the exception of Monroe Piers, eggs were fairly plentiful in all the fields operated, though their quality was not quite equal to last year's. Collections of eggs from all sources aggregated 351,260,000, of which 135,260,000 were shipped direct from the field in the green state to fill the applications of various State fish commissions and to supply deficiencies in the stock at other Great Lakes hatcheries of the Bureau, leaving 215,021,000 for development at the home station. From this stock 175,500,000 healthy, vigorous fry were produced, all of which were liberated in April on the various spawning grounds in Lake Erie.

The weather conditions on Lake Erie early in April were unfavorable for pike-perch work, as the ice was blown by the prevailing winds to the upper end of the lake and held there until it had practically all melted, preventing the manipulation of the fishermen's nets, retarding the run of fish, and delaying the spawning season some time beyond its usual opening. Eggs were not received in noteworthy quantities until April 17, and even after spawning began there seemed to be no regular run of fish at any point except in the vicinity of Port Clinton, Ohio. At all of the other fisheries the collections fell far short of an average season. The total take of eggs amounted to 445,775,000, about 66,000,000 less than in the previous year. Assignments of green and eyed eggs aggregating 180,000,000 were furnished to various Federal, State, and private hatcheries, and from the remaining stock 68,300,000 fry were produced and distributed practically without loss, the percentage of hatch being only 32½.

Lake-trout eggs for the Cape Vincent station were obtained from fishermen operating at Amherst, Wolfe, and Pigeon Islands, Canada, and from those working near the Galloo and Stony Islands and at Charity Shoals, N. Y. From these various sources over a million eggs were secured, but, owing to interference with the work by several severe storms, some of them were held in the field too long for successful development and only 717,000 good eggs reached the hatchery. These produced 363,186 fry, which were planted on the spawning grounds in Lake Ontario, together with 5,190,000, resulting from a shipment of eggs transferred to Cape Vincent from another lake.

Whitefish eggs for the Cape Vincent hatchery were secured from commercial dealers operating at the various fisheries on Lake Ontario, and collections in cooperation with the State fisheries authorities were undertaken at Old Forge and Lake Saranac, N. Y. From these various sources 10,862,000 were obtained, of which 3,800,000 were of the small Stanley whitefish, derived from Lake Saranac. This stock being insufficient to fill the requirements of the region, eggs to the number of 15,000,000 were forwarded in the green state from the Lake Erie fields. The output of fry from both lots, amounting to 12,900,000, indicates a very low percentage of hatch, due in large measure to the inferior quality of the western eggs. In conjunction with the whitefish collections, 106,875,000 lake herring, or cisco, eggs were purchased from the commercial fishermen of Lake Ontario and hatched, yielding a total of 76,000,000 fry for distribution on the local spawning grounds.

During the spring months the collection of pike-perch eggs for stocking the Cape Vincent station was undertaken in cooperation with State officials at Ogdensburg, N. Y. From this source 70,250,000 eggs were obtained as the Bureau's share, and, after being sufficiently

hardened in a small temporary battery at Ogdensburg, they were forwarded to the Cape Vincent station for development. The stock was further supplemented by 55,000,000 green eggs from the Swanton field, and from the two lots about 50,000,000 were hatched and distributed in the public waters of the region.

As in the Great Lakes, the pike-perch spawning grounds in Lake Champlain were covered with ice at the time the spawning of that species occurs during a normal season. However, large numbers of fully matured fish later ascended the Missisquoi River, and from the nets of the commercial fishermen there were secured eggs sufficient to stock the Swanton hatchery.

The arrangements that have been in force on Lake Champlain for the past three years were again put into effect, three crews being operated, and all ripe female fish available were purchased of the fishermen and taken direct to the spawning station and stripped. Egg collections extended from April 17 to the end of the month, the number secured amounting to 374,075,000, of which 84,125,000 green and eyed eggs were utilized in filling applications and in stocking various Federal hatcheries.

The water supply for the Swanton station is furnished by the village water company and is of excellent quality, but the quantity available for the work is at times uncertain. It having become apparent early in the season that the supply would be insufficient for the conduct of the hatching operations in the usual manner, steps were taken to install an electrically driven pump, and by this means the outflow from the fry tanks was run back to the upper supply trough and used over and over, a small quantity of fresh water being constantly added and a like amount of used water discarded. As far as could be observed, no ill effects to fry or eggs resulted from this arrangement.

The incubation period was retarded by the cold, inclement weather prevailing through May, but, hatching having once begun, all the fry came out about the same time, necessitating very rapid and constant work in making shipments to applicants and to public waters.

For the purpose of effecting a wider distribution of pike perch in the southern sections of Lake Champlain than is possible when shipped from Swanton a cooperative arrangement was entered into with the Vermont fishery authorities whereby the Bureau agreed to construct and operate a portable hatchery at Burlington, Vt., the State to bear the expense of the undertaking. The plant, consisting of a 100-jar battery, a supply tank, and 2 collecting tanks, was gotten in shape and transferred in sections by the station launch from Swanton to Burlington, where it was set up on the dock of the Champlain Transportation Co. and covered with a canvas shelter. By means of pumps, driven by an electric motor, the water supply for the hatchery was conveyed from the lake to the supply tank installed on one of the dock buildings and from there conducted by gravity to the upper trough of the battery. About 30,000,000 eyed eggs, transferred from Swanton station, were successfully hatched in this outfit, and, as the water supply was of lower temperature than at Swanton, the hatching period was retarded sufficiently to make it possible to distribute the product after the fry at Swanton had been disposed of. The Bureau is indebted to the Champlain Transportation Co. and to various owners of private motor boats, who rendered valuable assistance in effecting a wide distribution of the fry in the open waters of the lake.



## OPERATIONS OF THE INLAND HATCHERIES.

It is possible to record another successful year's work at the numerous interior stations where trouts and basses are cultivated. These fishes bring the Bureau's activities in practical touch with very large numbers of farmers, anglers, and other individuals usually interested in the stocking of minor lakes, ponds, and streams. The recognition of the value of fish culture on the farm and of the possibility of maintaining a fish pond on practically every farm in the country is becoming more widespread as the Bureau's efforts to this end are more generally made known. Many daily newspapers and several monthly home journals with very large circulation have ably seconded the Bureau's propaganda, and as a result of all the publicity there has been a demand for thousands of copies of "Fish ponds on farms," a document prepared for the special purpose of giving practical instructions for making and maintaining private fish ponds. Already many hundreds of people in all parts of the country have acted on the information thus acquired, have obtained supplies of suitable fishes from the Bureau, and have added pond culture to their agricultural pursuits.

The aggregate output of pond fishes in 1916 was not equal to that in 1915, but with the increased production of certain species at certain stations and the larger average sizes of the fishes distributed the general results have been far more satisfactory than in any preceding year.

The only material falling off in the operations of the trout stations occurred in Yellowstone Park, where the important work addressed to the blackspotted trout was curtailed by peculiar physical conditions that affected spawning. In the summer of 1915 the water stages in Yellowstone Lake and tributary streams were from 2 to 3 feet below normal, and while thousands of spawning fish made their appearance in the lake only a small proportion entered the streams in which traps for their capture had been installed. As a result the egg collections were less than half those of the preceding year. In the spring of 1916, at the time when the spawning of the blackspotted trout usually begins, floods and washouts were prevalent in the waters of the park, owing to the melting of the heavy masses of snow in the mountains, and, while the prospects indicated a successful collecting season later on, no eggs whatever had been taken up to the close of the fiscal year.

The Madison Valley, in Montana, where Federal fish-cultural operations were inaugurated several years ago, is proving a prolific field, now that the Bureau has the hearty cooperation of the Montana authorities in the enforcement of the State law prohibiting public fishing during the close season. Heretofore the Bureau has been compelled to submit to a large amount of illegal fishing in connection with its rainbow-trout operations in this field, the nuisance assuming such proportions in the spring of 1915 as to practically nullify its efforts with that species. Steps were, therefore, taken in advance of the recent spawning season to secure the aid of the State wardens, and under the efficient protection thus afforded wild rainbow-trout eggs in excess of 1,700,000 were taken. A notable collection of grayling eggs also was made in streams in Madison Valley, the season's aggregate amounting to nearly 6,500,000.



Brook-trout field operations in connection with the Leadville station were prosecuted as usual and resulted in a normal take of eggs. The newly exploited field near Creede, Colo., promises to yield large returns in brook-trout eggs at small cost, but the prospects for future rainbow-trout development are not encouraging, as the spawning season of that species in the Rocky Mountain States is usually coincident with very unfavorable climatic conditions. Efforts were made during the past spring by the superintendent of the new station at Saratoga, Wyo., to establish rainbow-trout collecting stations, but without any marked degree of success. There is a growing demand for the rainbow trout in the Rocky Mountain region, and the Bureau's hatcheries are doing their utmost to meet it.

A large percentage of the trout produced at the Leadville, Spearfish, and Bozeman hatcheries has in late years been distributed in waters of the national forests. A program for the systematic stocking of such streams and lakes has been agreed on with the Department of the Interior, and the Bureau is following it out to the full extent of its facilities.

The trout hatcheries of the Mississippi Valley and the North Atlantic States supplied the usual numbers for distribution, and, owing to improved water supplies, the heavy losses sustained by some stations in 1915 were not repeated. Considerable improvement was shown in the condition of the stock of certain stations, and at St. Johnsbury the epidemic of former years assumed a very mild form. Owing to this fact, the output of brook trout at that station was larger by one-fourth than in the preceding year. The Craig Brook, Me., hatchery made notable progress in trout culture, its distributions comprising 936,410 fingerlings, against 173,408 fry in 1915. More important than the increased numbers was the success attained in rearing large fingerling fish, which have been greatly needed for stocking the waters of Maine and adjacent States.

The operations with landlocked salmon at the Green Lake hatchery and its auxiliary at Grand Lake Stream resulted in a gain of 38 per cent over the egg collections of the previous year. The perpetuation of the landlocked salmon is a very important feature of the Bureau's work. This species has been widely sought by the sportsmen of far distant States, but, owing to the limited supply, it has been deemed best to confine the distribution to those waters of New England where the natural conditions approach most closely to those of its natural habitat. It is hoped to extend the field for egg collections, and with that end in view several thousand fry are being reared at the Craig Brook station for the purpose of stocking a lake in the vicinity, where the natural conditions seem to be entirely favorable.

The Mammoth Spring, Ark., output was curtailed by reason of a flood sweeping through the pond system in August, 1915, and carrying out many fingerling fish that were being held for fall distribution and also a large part of the brood stock. Later additions to the breeding fish proved inferior to those lost, and several seasons will probably be required to bring the station back to its former efficiency.

The Tupelo, Miss., station produced practically the same numbers of pond fishes as in 1915. This hatchery has made marked progress during the past few years and now ranks third in the production of bass. The outlook appears to justify the recommendation that the pond system be completed in accordance with the original plans.

The Cold Spring, Ga., hatchery doubled its black-bass output of the preceding year. The gain is attributed to new brood stock and to the location of a new and valuable collecting field at Milltown, Ga. With nominal expenditures for fixed equipment at Milltown, the superintendent predicts that the output another year can be increased by 400 per cent.

The Orangeburg, S. C., station has proved wonderfully successful in black-bass propagation, distributing during the spring months 135,000 fingerlings, and at the end of the fiscal year many thousands remained in the ponds for fall assignment. This is the first season's fish-cultural operations at the Orangeburg station, and the results portend conspicuous efficiency for the future.

Pond-cultural operations at the combination trout and bass stations were practically a duplication of former years. At St. Johnsbury, Vt., the superintendent has taken up the collection of smallmouth black-bass fry from Crystal and Tarleton Lakes, transplanting them in the station ponds to be held until they are of fingerling size. The collections are from lakes that the State officials desire to reserve for trout and salmon, and liberal plants of the latter are made in return for the bass fry collected. While the output is relatively small as compared with that of the exclusively pond stations, the availability of bass for special distribution in New England is of such importance that the output is of great value and comes near to satisfying the demand for that species in that region.

Besides the commercial fishes before mentioned, the Northville, Mich., station hatched and distributed 771,000 brook-trout fry, 190,000 rainbow-trout fry and fingerlings, and a few thousand grayling fry. The eggs of the first named were purchased and the others were transferred from stations of the Bureau. It also produced in the station ponds during the year 326,125 fry and fingerling smallmouth black bass.

One of the most successful features of pond culture has been the noteworthy production of the smallmouth black bass at Northville. At this station 600,000 fry were hatched; of these 288,000 were immediately shipped and the remainder held for rearing. At the close of the year 38,125 had been distributed, and it is estimated that 3 carloads remained in the ponds for later shipment. With this stock the Bureau will be able to quite thoroughly supply all old applications for this species in Michigan, Wisconsin, Minnesota, and Ohio. Such favorable conditions for smallmouth black-bass propagation as are apparent at Northville will be taken advantage of and the facilities improved in order that the output may be further enhanced. This species is very difficult to propagate under average conditions, and as the demands for it are annually increasing every opportunity will be taken advantage of to meet it.

#### MARINE FISH-CULTURAL WORK.

The output of all species propagated at the marine stations was materially larger than in the preceding year, with the exception of the lobster. The work at these stations was conducted along the usual lines and on the whole was successful, though it was hampered to some extent by unfavorable climatic and other uncontrollable conditions.

During the summer and fall of 1915 berried lobsters to the number of 17,808 were purchased and placed in the Boothbay Harbor pound, to be carried through the winter. When removed in April this stock was found not to have stood confinement well, the loss amounting to 4,898 individuals, or 29 per cent of the original number, while among the survivors barren and scantily egged ones were plentiful. Only 123,929,000 eggs were realized, an average of less than 10,000 per lobster, which is a very low average. The poor results may in part be attributed to an abnormally warm fall and winter. No ice formed on the pound until the middle of February, and as a consequence the lobsters failed to burrow in the mud and remain quiet, as they usually do, and losses of eggs were caused by their continual crawling over the bottom of the inclosure. The high temperature also forced the development of the eggs and caused the hatching of large numbers in the pound, this being evidenced by the appearance of many of the lobsters. A contributing cause of loss was the impossibility of securing suitable food at all times. A compensating feature of the year's work was that the quality of the fry produced and distributed was most excellent.

Additions to the supply of lobster eggs for this station were made by the purchase of 6,510,000, resulting from 289 berried lobsters which had been collected by the Maine Department of Sea and Shore Fisheries during the winter and held in live cars; also by collections from freshly caught lobsters during the spring months. The latter numbered 476, and from them 13,164,000 eggs were obtained, an average of 28,000 per lobster.

In February a search was instituted for cod eggs, and a little later for haddock eggs also, regular trips being made to the fishing grounds by the station steamer and a force of spawn takers whenever the weather permitted. Very few fish of either species were taken, however, and there was an entire absence of haddock in spawning condition. As a result of the spring's work 11,203,000 cod eggs were taken, a very small return for the effort expended.

During March and April 5,450 brood flatfish, taken in fyke nets in the vicinity of the station, were placed in retaining tanks in the hatchery. Part of these fish were allowed to spawn naturally, while the others were overhauled daily and the mature eggs taken and fertilized. Altogether 618,308,000 eggs were obtained, from which 583,707,000 fry were hatched and distributed. This egg yield not only represents the largest number ever obtained at Boothbay Harbor station, but the losses during incubation were smaller than heretofore and the fry hatched were strong and of excellent quality.

The surplus pollock eggs accumulating at the Gloucester station from time to time during the winter were transferred by means of the steamer *Gannet* to the Boothbay Harbor station, four trips being made for the purpose. As on previous occasions, the eggs did not stand transportation well; and, though various methods were employed in making the shipments, all were equally unsuccessful, only 48,892,000 of the original 126,080,000 carried reaching the station in good order.

During the first two months of the fiscal year the employees of the Gloucester station made small collections of eggs of the mackerel and butterfish. The mackerel eggs proved very poor and only an insignificant number of fry were hatched, but the butterfish eggs yielded

a large percentage of fry of good quality. Again in June, 1916, a few million mackerel eggs were collected, and these were in course of incubation at the end of the fiscal year.

Pollock work at the Gloucester station was taken up November 1, the crew of the *Grampus* and several temporary spawn takers being assigned to make egg collections from gill-net fishermen operating in the vicinity of Cape Ann. Up to the middle of December the supply of eggs was merely normal, but during the last half of the month and all during January the daily receipts were heavy, often exceeding 75,000,000, and on one occasion 129,000,000 were secured. These enormous daily collections several times filled the hatchery to overflowing and left a large surplus stock to be otherwise disposed of. The spawning season extended from November 1 to February 17, and the aggregate collections amounted to 1,713,730,000, of which 126,000,000 were sent to Boothbay Harbor station for incubation and 335,620,000, for want of hatching facilities, were planted in the open sea off Gloucester. The eggs incubated at the station produced 752,040,000 fry.

Commercial fishermen began operating for cod in fields adjacent to the Gloucester station in January, but no ripe eggs were secured until February 10. The bulk of the season's collections, which were materially larger than in the past two years, was obtained in March and the first week in April. In the second week of April, when ripe fish were still plentiful, the spawning season was brought to a sudden close by heavy spring freshets, which caused the surface water all along the shore, and from 15 to 20 miles out, to become quite fresh. The total number of eggs obtained was 145,630,000, from which there was a hatch of 94,550,000 fry.

From fyke nets operated near the outer harbor at Gloucester in late winter a sufficient number of gravid flatfish were obtained to yield 219,610,000 eggs, and from them 200,680,000 fry were hatched.

The haddock fishing season began several weeks later than usual, causing an unusually short egg-collecting period. Between April 12 and May 5, 36,720,000 eggs were secured from the gill-net fisheries off Cape Ann, which number produced 22,170,000 fry for distribution.

The scarcity of egg-bearing lobsters within the reach of the Gloucester station and the unfavorable conditions attending the collection of brood lobsters and their eggs have had the effect of practically suspending lobster hatching at this point. In the fall of 1915 an experimental lot of 21 egg-bearing lobsters was purchased and placed in a live car to be carried through the winter. When removed therefrom about the middle of May, only 16 specimens were alive. These yielded 210,000 eggs, which, with 320,000 additional eggs purchased during the spring, represented the entire supply of the hatchery.

In view of the small results attained at the Woods Hole station in recent years in collecting cod eggs from the fishermen operating in Cape Cod Bay, it was decided to discontinue the operations there and rely solely upon brood cod obtained from commercial fishermen. Arrangements were accordingly made to prosecute this work on an extended scale, and the spawning inclosure provided for the purpose was stocked during November with 3,100 brood fish, a larger number by 700 than had heretofore been held therein. The fish were of exceptionally fine quality and the mortality was negligible. Eggs

were obtained from the inclosure between December 1 and February 16, the spawning season beginning about the usual time but closing fully a month earlier than in 1915. Of the total collection of eggs, amounting to 286,056,000, only 265,877,000 could be handled with the available hatching facilities. The remainder were therefore transferred to the Gloucester station. The incubation of the eggs proceeded favorably except for occasional periods of roily water, at which times some losses were sustained, owing to the inability to keep the hatching boxes working properly. The final results were 192,275,000 fry, which were liberated in local waters.

The first brood flatfish of the season at Woods Hole were purchased from commercial fishermen on January 12, but, having been taken from deep water, their eggs were not sufficiently developed to mature satisfactorily in confinement. The fish were therefore released later in the season to provide room for more advanced stock. Brood flatfish were secured as heretofore from the grounds at Waquoit and Wickford and from the newly established field at Menemsha Pond, 12 miles distant from the Woods Hole station. Between January 18 and the end of March, 1,099,622,000 eggs were secured, and had there been facilities for handling them it is believed several billions of eggs might have been obtained from the fish in sight at Menemsha Pond. The fry hatched numbered 748,560,000, the percentage of loss in incubation being larger than last year, owing to the difficulty experienced at times with roily water.

#### RESCUE OF FISHES FROM OVERFLOWED LANDS.

The usual work of rescuing food fishes from the overflowed lands along the Mississippi and Illinois Rivers, by seining crews sent out from the regular stations and by special field parties, was conducted at Homer, Minn.; La Crosse, Wis.; North McGregor, Iowa; Bellevue, Iowa; Friar Point, Miss.; and Meredosia, Ill. Water stages on the upper river were so high during summer that no work could be accomplished until August 25. The total collections were larger than for many years, 11,682,064 valuable fishes being rescued. Of this number, 1,179,862 were delivered by cars and messengers to applicants or for planting in distant public and private waters; the remainder (10,502,202) were returned to the Mississippi River.

A most conspicuous public service was rendered in March and April by the rescue of some 5,000,000 large fingerling and adult fish, buffalo-fish and carp predominating. These were taken from an overflowed area 11,000 acres in extent, across the Illinois River from the Bureau's station at Meredosia, Ill. The preceding year fish dealers in that vicinity had impounded several thousand adult fish in a large lake back of the levees protecting the district. Subsequent rains inundated the entire area, scattering the breeding fish far and wide during the spawning season; and as the water receded their offspring, being unable to escape to the river, became congested in unbelievable numbers in drainage ditches and depressions of the land. Their total loss would have been inevitable had it not been for the prompt action of the Bureau in conducting rescue operations so long as funds were available. The majority of the stranded fish were thus saved, and their return to the Illinois River must serve to add materially to the resources of that stream in years to come. It is

the desire of the Bureau to secure adequate funds for increasing this work throughout the Mississippi Valley, as the present operations are wholly incommensurate with the field to be covered. Buffalo-fishes, carp, and catfishes, the mainstay of the commercial fisheries there, are noticeably decreasing, although sufficient young of these species are each year perishing on the overflowed lands to maintain the present fisheries and increase the future supply if proper measures for their salvage are taken.

#### ACCLIMATIZATION.

The transfer of humpback-salmon eggs from the Pacific coast to the Maine hatcheries was repeated in the fall of 1915, and in the spring of 1916 the third plant of the species was made in the waters of that State, which were at one time replete with the Atlantic salmon. The young available for distribution, numbering 6,225,808 and ranging from  $2\frac{1}{2}$  to 6 inches in length, were deposited in previously selected streams under very favorable conditions.

The success of this interesting experiment in acclimatization seems assured. There was a remarkable return of mature fish in the summer and fall of 1915, the outcome of plants made in the spring of 1914. Many fish weighing over 5 pounds were taken or seen in the Penobscot River, and 20 were captured alive by agents of the Bureau near Bangor and held in an effort to obtain ripe eggs. From two of these fish 3,000 eggs were taken on September 6 and, after fertilization, sent to Craig Brook, where incubation was completed with normal results. Accounts of the appearance of this new fish in various minor rivers have come in, and in the Dennys River there was a noteworthy run which began as early as August 15 and continued as late as September 24. The local fishermen caught and ate large numbers, and during the week of September 20 an employee of the Green Lake hatchery took 15 fish (8 males and 7 females) which had passed through the fishways in dams in Dennys River and were dropping downstream in a spent condition. At the same time both live and dead fish were observed below the dams.

Another carload lot of Atlantic lobsters from Maine was sent to the Pacific coast on November 15, 1915. The shipment, consisting of 5,423 adults about equally apportioned as to sex, reached its destination on November 20 in much better condition than any previous lot. At the railroad terminus (Anacortes, Wash.) the lobsters were placed in four floating live cars that had been prepared for them, and there allowed to feed and to recuperate overnight. The following morning they were towed in the crates to the San Juan Islands, in Puget Sound, and liberated in Bellingham Channel, off Guemes Island. The number of strong, healthy lobsters planted was 3,325, or over 61 per cent of the original consignment.

During the fall of 1915 a shipment of large crabs from Puget Sound to the New England coast was made. Owing partly to a wreck and partly to difficulties in handling, only a small number survived the journey. These were liberated in good condition off the coast of Maine.

Limited consignments of fish, lobsters, and fish eggs to foreign countries and insular possessions were made during the year. Fifty thousand rainbow-trout eggs were sent to Portugal, 200 adult

lobsters to Japan, and 600 black bass, 1,500 sunfish, and 1,500 catfish to Porto Rico.

## COOPERATION WITH THE STATES.

The Bureau has been glad to continue its usual cooperative relations with State fishery authorities, and has furnished on request large numbers of eggs of various species for development in State fish hatcheries and also considerable numbers of young fish for planting under State supervision. A list of the States to which such assistance was rendered, and the allotment of fish or eggs in each case, are shown by the following table:

ALLOTMENTS OF FISH AND EGGS TO STATE FISH COMMISSIONS, FISCAL YEAR 1916.

State and species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
Alabama: Black bass.....			1,000
California: Chinook salmon.....	19,622,340		
Colorado:			
Blackspotted trout.....	160,000		
Brook trout.....			1,500
Delaware:			
Black bass.....			375
Shad.....		400,000	
Illinois:			
Black bass.....			5,040
Brook trout.....	25,000		300
Carp.....			249,000
Catfish.....			62,900
Crappie.....			35,390
Pickerel.....			560
Pike perch.....	20,000,000		
Rainbow trout.....	50,000		9,750
Sunfish.....			6,240
Yellow perch.....			1,600
Indiana: Pike perch.....	15,000,000		
Iowa: Pike perch.....	25,000,000		
Kentucky:			
Pike perch.....		9,600,000	
Rainbow trout.....			16,000
Smallmouth black bass.....		7,500	
Maine:			
Brook trout.....	100,000		
Lake trout.....	50,000		
Landlocked salmon.....	300,000		
Maryland: Brook trout.....	50,000		
Massachusetts:			
Pike perch.....	25,000,000		
Shad.....	1,097,000		
Yellow perch.....	15,000,000		
Michigan:			
Lake trout.....	3,000,000		
Landlocked salmon.....	25,000		
Pike perch.....	26,235,000		
Smelt.....	10,000,000		
Minnesota:			
Lake trout.....	200,000		
Landlocked salmon.....	25,000		
Steelhead trout.....	250,000		
Montana:			
Blackspotted trout.....	200,000		
Brook trout.....	50,000		
Catfish.....			940
Grayling.....	2,300,000		
Pickerel.....			565
Rainbow trout.....	320,000		
Sunfish.....			625
Yellow perch.....			475
Nebraska: Pike perch.....	1,500,000		
New Hampshire:			
Brook trout.....	50,000		
Lake trout.....	100,000		
Landlocked salmon.....	25,000		
Rainbow trout.....	100,000		
Steelhead trout.....	93,000		

ALLOTMENTS OF FISH AND EGGS TO STATE FISH COMMISSIONS, FISCAL YEAR 1916—  
Continued.

State and species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
New Jersey:			
Landlocked salmon.....	10,000		
Rainbow trout.....	50,000		
Smallmouth black bass.....			159
Steelhead trout.....	93,000		
Yellow perch.....	10,000,000		
New York: Landlocked salmon.....	25,000		
North Dakota:			
Pike perch.....	6,000,000		
Steelhead trout.....	93,000		
Ohio:			
Pike perch.....	68,425,000		
Whitefish.....	68,640,000		
Oregon:			
Blackspotted trout.....	200,000		
Blueback salmon.....	3,000,000		
Chinook salmon.....	1,000,000		
Silver salmon.....	195,000		
Steelhead trout.....		500,000	
Pennsylvania:			
Lake trout.....	100,000		
Pike perch.....	3,000,000		
South Dakota:			
Brook trout.....			50,000
Loch Leven trout.....			30,000
Pike perch.....	25,000,000		
Utah:			
Brook trout.....	100,000		6,000
Lake trout.....	50,000		
Vermont:			
Catfish.....			150
Lake trout.....	201,054		
Landlocked salmon.....	50,000		
Smelt.....	15,000,000		
Steelhead trout.....	150,000		
Washington:			
Brook trout.....	50,000		
Blackspotted trout.....	432,000		
Rainbow trout.....	100,000		
Wisconsin:			
Lake trout.....	3,500,000		
Whitefish.....	5,000,000		
Wyoming:			
Blackspotted trout.....	200,000		
Brook trout.....	50,000		
Grayling.....	400,000		
Lake trout.....	25,000		
Rainbow trout.....	100,000		
Steelhead trout.....	200,000		
Total.....	377,367,394	10,507,500	478,569

FISHES PLANTED IN CONNECTION WITH FISH-CULTURAL EXPERI-  
MENTAL WORK.

The fisheries biological station at Fairport, Iowa, engages not only in mussel propagation, but in experiments relating to the propagation and rearing of useful fishes. The experiments are conducted not for the purpose of distribution, but for the acquisition of knowledge of practical value in fish culture. Nevertheless, large numbers of fish are produced, and the surplus is liberated in the public waters, usually in the vicinity of Fairport, and in connection with operations of mussel propagation. The following table shows the number of each species distributed and the stage in which planted. These figures are not included in the report of regular distributions elsewhere referred to.



## FISHES DISTRIBUTED AND STAGE IN WHICH PLANTED.

Species.	Fry.	Finger-ling.	Adult.	Total.
Largemouth black bass.....		5,332		5,332
Smallmouth black bass.....	4,500	719		5,219
Sunfish.....		54,723	419	55,142
Crappie.....		5,335	4	5,339
Buffalofish.....	9,911,250	24,350		9,935,600
Catfish.....		2,657	144	2,801
Missouri sucker.....	83,000			83,000
Total.....	9,998,750	93,116	567	10,092,433

## ARTIFICIAL PROPAGATION OF FRESH-WATER MUSSELS.

The propagation of fresh-water mussels is pursued in connection with the operations of the fisheries biological station at Fairport, Iowa, chiefly through field parties at various places in the Mississippi Basin. The object of this work is the increase of the mussels whose shells are utilized in the extensive pearl-button industry.

During the year the inoculation of fishes with the larval mussels, which is the only known method of propagation, was actively continued, and increased efficiency is to be noted. Owing to exceptionally high and prolonged flood stages of the central rivers, it was impossible at times to accomplish the best results, and the number of larval mussels planted was, therefore, slightly less than in the preceding year, being 331,451,490, compared with over 344,000,000 in 1915. These belonged to seven species of commercial mussels, as shown in the following table. The actual cost of production was 1.55 cents per thousand, but if allowance is made for overhead charges the cost per thousand was 2.35 cents, against 2.7 cents in 1915. In connection with this work, 34,772 adult and 265,462 fingerling fish were rescued from landlocked ponds in the overflowed lands and returned to public waters. The total number of fish handled was 424,550.

## MUSSEL PROPAGATION, FISCAL YEAR 1916: POINTS OF DEPOSIT AND SPECIES OF GLOCHIDIA USED FOR INFECTION.

Species	Mississippi River.		Wabash River: Vincennes, Ind.	Black River: Black Rock, Ark., and south.	White River: Newport, Ark., and vicinity.	Total.
	Fairport, Iowa.	Lake Pepin, Minn.				
Black sand-shell ( <i>Lampsilis recta</i> ).....	11,288,300					11,288,300
Butterfly ( <i>Plagiola securis</i> )...	415,800				411,800	827,600
Lake Pepin mucket ( <i>Lampsilis luteola</i> ).....	20,990	151,175,000				151,195,990
Mucket ( <i>Lampsilis tigamentina</i> ).....	73,043,500		3,553,500	26,711,100	63,928,300	167,236,400
Blue-point ( <i>Quadrula plicata</i> ).....	147,000					147,000
Pocketbook ( <i>Lampsilis ventricosa</i> ).....	447,000					447,000
Yellow sand-shell ( <i>Lampsilis anodontoides</i> ).....	309,200					309,200
Total.....	85,671,790	151,175,000	3,553,500	26,711,100	64,340,100	331,451,490

**MARINE AND FRESH-WATER INVESTIGATIONS, SURVEYS, AND EXPERIMENTS.****STUDIES OF MARINE FISHES.**

Notwithstanding the long existence of great marine fisheries and the common assumption of their inexhaustibility, the development of modern fisheries has been such as to call for the artificial propagation of certain species and to create a demand for knowledge of the life histories, the habits, and the migrations of the important fishes. This knowledge is desired in order that we may determine with what impunity the fishing methods may be continually increased in extent and thoroughness, or what measures of protection may be appropriate, and so that we may properly appraise the value and the possibilities of cultural operations as applied to marine species. The problem must be approached through a complex but systematic plan of study, and final results are not obtainable in a short time. Nevertheless, the continued collecting of fishes at various places and in the different seasons, the persistent application of the methods of modern science to the details of structure that may be characteristic of different localities or ages or seasons or that may be indicative of migrations or other phenomena of life, and the careful consideration of the conditions and results of commercial fisheries will bring us finally to the attainment of a degree of precise knowledge that a few years ago we could not have anticipated.

The investigation of the sea herring, which, as the basis of the herring and sardine industries, is one of the most important fishes of the North Atlantic coast, has been continued in connection with the oceanographic work of the schooner *Grampus*. The analysis of the data gathered has been pushed as rapidly as possible and it is expected that the results will be ready for publication within a short time.

The most important commercial fish of the South Atlantic and Gulf seaboard is the mullet. Careful studies pursued through temporary services in connection with the Beaufort laboratory have laid a definite and necessary basis for more comprehensive inquiries when it may be possible to carry them out. It is expected that a detailed report of the result of the studies can be published after the conclusion of one more season's work.

An investigation of the habits and possible races of flounders has also been undertaken on the coast of New England, but as the study is only in its incipency and the investigator has not yet been able to devote to it his entire time it is not now possible to report a definite degree of progress.

For several years the Bureau has directed attention to the condition of the tuna fishery on the coast of southern California, which, with the canning industry based upon it, has shown such marked development in the last few years. The fishery and canning industries are subject to unfortunate vicissitudes because of the irregular appearance of the tuna in the waters accessible by the present methods of fishery. Nothing of a definite nature has been known as to the habits of the tuna, the causes that govern their appearance and disappearance, the parts of the ocean generally frequented by them, or the localities resorted to for purposes of breeding. For nearly two years the Bureau has attempted to gain such information as was

obtainable through investigations conducted from shore or by the use of small boats. It was realized that the proper method of attack was through investigations extending over a large area of the ocean and conducted through the instrumentality of a seagoing vessel. This was fortunately made possible in February, 1916, when Congress through an urgent deficiency bill provided an appropriation which enabled the Bureau to detail the steamer *Albatross* for special service in the tuna investigation. The first cruise was promptly begun, and on May 10 the vessel arrived at San Diego after spending three weeks in cruising along the coast of Lower California and several hundred miles farther south and west, as far as Los Coronados Islands. Other cruises followed this one, and the investigation was in progress as the fiscal year closed. From the middle of April to the middle of May there were no tuna along the Lower California peninsula from San Diego to Socorro Island and westward to Guadalupe Island. Two of the best practical tuna fishermen of San Diego accompanied the vessel on this cruise. In the latter part of May tuna were encountered off Lower California near San Geronimo Island, and near the San Benito Islands; none were found on a cruise extending west of San Diego 150 miles. During the month of June tuna were present off San Diego and San Pedro, although they were not taken in commercial quantities, this being attributed to the coldness of the surface water. The investigation has been somewhat hampered by the continued prevalence of rough weather, but will be continued and prosecuted as actively as possible during the next fiscal year.

The importance of a knowledge of the larval development of fishes was cited in the last annual report. Such studies have been continued both at the Woods Hole laboratory and in connection with the investigations in Chesapeake Bay. At the Woods Hole laboratory substantial information was gained regarding 12 species, 6 of which are of direct commercial importance, namely, the tautog, cunner, scup, sea robin, whiting, butterfish, anchovy, menhaden, glut herring, silver-side, three-spined stickleback, and four-spined stickleback. For years the Bureau has endeavored to gain information regarding the breeding habits of the menhaden. With the knowledge gathered during the present fiscal year, the Bureau is now in better position to follow up the life history of the menhaden.

Near the close of the fiscal year and in connection with the Chesapeake Bay investigations, additional data were obtained regarding the eggs and larvæ of the anchovy, hog choker, goosefish, and gray trout (squeteague). Experiments with hatching of butterfish were attended with success.

#### SHELLFISH INVESTIGATIONS.

The oyster, as the most important food resource of our waters, has continued to command such attention as it was possible for the Bureau to bestow. Owing to the fact that oyster culture, where it is now practiced, has reached a relatively advanced stage of development and, where not practiced, is hindered by peculiar economic conditions, the problems of the industry are comparatively complex and difficult of solution. Until the close of the fiscal year 1916 the Bureau had not been in position to give the continued and effective attention to the oyster that it deserved. Recent action by Congress has to a large extent remedied this deficiency and more effective serv-

ice to the oyster fishery may be expected in the future. This has been brought about by the establishment of several new positions carrying salaries that will attract and retain competent assistants.

Meantime the Bureau has sought to attack such problems of oyster culture as were adapted to its means and facilities. Encouraging progress has been made in studies of the propagation of oysters, the nutrition of oysters, and the occurrence of phenomena of "greening" and "green gill." In the study of "green gill" the results have been of unusual interest and value. While no method of controlling the "green gill" has been determined, it seems well established that the green color is due to the presence of a particular diatom, one of the minute floating plants that form a large element of the food supply of oysters. This particular species of diatom is known as *Navicula ostrearia*, and is identical with the form which is abundant in the region of Marennes, France, and which gives to the oysters of that region the peculiar color and flavor which are so highly esteemed. It is not yet ascertained what are the causes of the peculiar abundance of this form in certain years and in certain localities, but when it is known to the public that the occurrence of "green gill" merely means that the oysters have attained a condition that is so highly esteemed in the markets of Europe much should be done to dispel the present prejudice which occasionally causes great financial loss to our planters. Instead of being dreaded or a cause of pecuniary loss, the "green gill" may be welcomed as giving the opportunity to supply a superior article at perhaps a premium in price. These statements do not apply to the oysters which are marked by greening of the entire body owing to the presence of certain mineral salts in the water. This is a distinct condition not easily confused with the well-known "green gill."

The problems of oyster culture on the Pacific coast, where an industry of great possibilities is contending against peculiar natural difficulties, have received recognition, although not as yet in a manner commensurate with the actual needs. Some support has been given to investigations being pursued in Puget Sound, and the progress attained has been such as to justify the Bureau at the close of the fiscal year in arranging to extend a substantially increased measure of financial aid.

The remarkable growth of the blue-crab fishery during recent years has made protective action seem imperative, and the Bureau has been repeatedly importuned for counsel as to the propriety and effectiveness of specific measures proposed and for information regarding the habits and life history of the crab. Since the blue crab is migratory, passing at different stages of its life cycle from the waters of one State into those of another and going from the bays to the ocean and back, the Federal Government is the only agency which can properly and effectively complete the necessary investigations. The result of careful attention to the matter has been to perfect before the close of the year an arrangement under which competent services are secured for attacking the study in a thorough manner.

## PROGRESS OF DIAMOND-BACK TERRAPIN CULTURE.

The success which has previously been attained in the experiments in terrapin culture has been continued in the past year in even more marked degree. It is timely to summarize some of the more important results at the Beaufort laboratory.

(1) Perhaps the most interesting development of the year is the fact that the three oldest broods of terrapin that were hatched in the experimental pounds and grown in captivity have produced eggs. The two oldest broods, one of which had been winter-fed during the first season while the other had been permitted to hibernate, began laying in 1915 and the eggs hatched successfully. The terrapin of the hatch of 1911 laid eggs in 1916, before the close of the fiscal year. These significant inferences may be made: (a) That terrapin born and reared in confinement develop in a normal way and will reproduce their kind; (b) that the reproductive cycle may be completed in six years, even though the terrapin hibernate as in nature; (c) that by preventing hibernation and forcing growth through the first winter by feeding in a heated house the maturity as well as the growth of the terrapin may be advanced by one year, so that a new generation is started in five years rather than in six.

(2) The adult breeding stock of terrapin has from year to year steadily increased in productivity, and there is ground for belief that the adult breeders have not yet reached the maximum capacity for reproduction. The following figures show the number of young produced by adult breeders during each of the past four years and also the average number per female yielded by the original stock of breeders:

Year.	Number of young from all adult breeders.	Average number per female of original breeding stock.
1912.....	1,326	12.81
1913.....	1,506	14.52
1914.....	1,690	15.23
1915.....	2,128	21.43

Those terrapin which have been longest in captivity produced in 1915 an average of 21.43 young for each female.

(3) The value of winter feeding during the first season is well established by the increased rate of growth, the shortening of the time required to attain reproductive maturity, and the very low rate of mortality. The death rate has never been so low as during the winter of 1915-16. Among 700 terrapin fed on fresh food the loss was about  $6\frac{1}{2}$  per cent, while among those fed on salted food the loss was about  $8\frac{1}{2}$  per cent. The death rate in hibernating stock was 13 per cent. The cost of food for winter feeding at Beaufort varies from 3 to 15 cents per 1,000 young terrapin per day, according as salt fish, fresh fish, or oysters are used. Assuming 10 cents as an average daily expenditure per 1,000 terrapin, the cost of food for 1 terrapin for a period of 5 months in the first winter would be  $1\frac{1}{2}$  cents.

(4) The death rate among terrapin after the first season is so small as to be nearly negligible. It is found to be about 1 per cent in the second year, diminishing with age to one-half per cent and less. The principal mortality occurs in the first season, and is then found to be chiefly among the "runts," which should probably be culled out in ordinary practice. While the death rate has been as high as 20 to 25 per cent during the first season, it has now been reduced, partly through improved methods of sanitation, to less than 10 per cent. The losses are remarkably low when it is considered that deaths occur principally when terrapin are very young and before they have become a source of expense, and that the productivity of the terrapin is such that even a loss of 30 per cent at this stage could readily be compensated for by increasing the numbers hatched and saved for rearing. So far as regards disease and death rate the rearing of terrapin is a matter of much less difficulty than the raising of poultry.

(5) The history of our experiments during many years gives strong grounds for belief that domestication of terrapin is accompanied by increasing productivity and diminishing disease and mortality. Our experience indicates the advisability of retaining a select brood stock for a rather indefinite period, instead of adopting new breeders from year to year, as might be done in stock raising. Some of the breeders have been in captivity for about 14 years.

It may be noted that the experiments in terrapin culture have not the nature of small laboratory tests but are carried out upon such a scale as to be comparable to commercial operations. It is possible also to check our results against those obtainable in a large local commercial venture which has adopted methods based upon those followed in the Bureau's work. From this it appears that the various results gained in the Bureau's experimental work are not to be taken as exceptional, but that they are, in a general way, typical of what may be expected in cultural operations conducted according to sound principles and with the exercise of proper care.

There are now about 3,000 terrapins under observation and classified in more than 25 experiments which are being directed to obtain definite answers to practical questions that yet demand attention and justify the continuance of the investigations. Among these are: What is the proper proportion to maintain between males and females, and what are the best conditions for prolificness in eggs and for successful hatching? What are the possibilities of improving rate of growth by selection, and what are the opportunities for promoting economy through proper culling or other methods? These are only some of the practical questions which warrant further investigations.

#### SURVEYS OF FISHING GROUNDS.

Some further work has been done in extending the known limits of the blackfish grounds off the coast of North Carolina. The Bureau maintains a buoy on the principal grounds, which is of service to fishermen both in locating this particular ground and as a bearing from which to find other grounds. The fishery is not developed in proportion to the evident possibilities, owing partly to the lack of suitable boats and partly to the unwillingness of local fishermen to engage in operations at any distance from the shore. One or two crews have, however, taken advantage of the opportunities and the

fishery was regularly followed through the winter and spring of 1915-16 with results that were very satisfactory to the fishermen and the vessel owners.

The survey of halibut grounds lying off the coasts of Oregon and Washington was continued by the steamer *Albatross* during the first three months of the fiscal year. The first trip of the *Albatross* was to grounds off the coast of Washington from Grays Harbor to Flattery Banks, but the abundance of ground and blue sharks rendered the location unpromising for the establishment of a fishery at that time. Two especially favorable halibut bottoms were discovered, one 31 miles west of Grays Harbor and the other 37 miles S. by W. from the Umatilla Lightship.

The second trip covered the same region by lines of sounding intended to determine the possible existence of offshore banks rising from the deep water. One such bank was located as apparently the top of a submerged mountain, rising 6,000 feet from the floor of the ocean. The depth ranged from 525 to over 830 fathoms. The bank is not shoal enough for fishing, but it suggests the possible existence of other banks that might be of greater practical importance. The location of the bank is about 278 miles from Cape Flattery Light, the latter bearing N. 66° E.

A third trip covered the region off the Columbia River and south therefrom as far as Cape Meares. Good halibut bottom was found S. 71° W. of Columbia River Lightship, 17 miles out. South along the 100-fathom curve to Cascade Head good bottom was noted for nearly the entire distance in 110 to 120 fathoms. A patch of suitable bottom was located 22 miles northwest of Cape Meares Light in 94 fathoms. The largest ground discovered by the *Albatross* on this trip lies between Tillamook Head and Cape Falcon, 28 to 30 miles from the coast. The bottom is of coarse and fine gravel, black sand, and granular shale, and an abundance of life was noted at the surface of the water. Important hydrographic observations were made and reported to the Coast and Geodetic Survey and to the Navy Department. A report of the halibut survey, with charts, will soon be published.

#### OCEANOGRAPHIC STUDIES.

If we were interested to know the capacity of certain lands for the support of particular kinds of animals; if we wished to ascertain the causes of the natural movements of such animals; or if we were to determine upon a proper policy of handling our stock in governance of their capture, or in endeavors to increase their numbers by cultural methods, we could not neglect to consider the character of the land in its various parts, its yield in vegetation small and large.

Similar inquiries, roughly speaking, when applied to the ocean constitute the science of oceanography. However it may appear to the eye, the ocean is not one great homogeneous body of water, but is marked by a diversity such as we are familiar with upon the land. Variations in depth, in saltness, in temperature, or in richness of animal and plant life are always encounterable, whether we proceed from the shores to the open sea, from the surface to the bottom, from east to west or north to south, from any one geographic region to another. There are variations from year to year, even from season to season; there exist veritable deserts where abundant fish might

starve from want of food, contrasted with zones of plenty. There are currents and counter currents and blendings of different waters. In one geographic locality, waters flowing from tropical regions and laden with characteristic animals and plants may overlies waters emanating from arctic domains and carrying their peculiar types of living things. If we do not have knowledge of such conditions, we can not determine whether a condition of extreme paucity of fish life such as was conspicuous on our eastern shores in the summer of 1916 is an indication of exhaustion of the fisheries or is an inevitable consequence of observable oceanographic abnormalities that can not be affected by man's operations; we will not be able to understand what general movements of fishes or variations in local abundance of fishes are attributable to unwise human operations and what are properly to be expected as a reflection of normal phenomena of nature.

Oceanographic studies are not new in this or other countries; and extensive data have been gained by the Bureau at various times during many years, but within the past few years the Bureau has planned for better coordination of such studies as could be conducted within its means. Operations have been pursued intensively in restricted regions, so that a completed exploration might be made and relations established with a degree of definiteness that would make it possible to deduce some practical conclusions.

The investigation of waters off the Atlantic coast, primarily in the Gulf of Maine and southward to the Grand Banks, has been continued in connection with studies of the life history and habits of the herring and other fishes. The schooner *Grampus* was detailed to this work with an assistant from the office in active charge of the observations, while the investigation was under the fortunate direction of a skilled oceanographer whose services were available to the Bureau. The results gained during preceding years have been made public from time to time and a final report may be expected within a short while.

Near as the Chesapeake Bay is to the center of administration and important as its fisheries are, we have been without systematic and detailed knowledge of the physical and biological features of its waters and of the effect of such conditions upon the constant movements and varying abundance of important fishes. Beginning in October, 1915, the steamer *Fish Hawk* was detailed to a general investigation of the Chesapeake Bay under the direction of a well-equipped assistant. At intervals of a month or six weeks there have been cruises over the bay, while observations of various sorts were made and material collected for later careful study. The investigation was by no means confined to technically oceanographic subjects, but a number of useful inquiries were embraced in the general scope of work and many valuable services rendered. The existence of resources in hydroids, or "sea moss," the basis of a possible new industry was demonstrated; the spawning habits and the life histories of fishes were studied; experiments were made with the propagation of certain species; crab fishermen were induced to experiment successfully with use of pickled dogfish and shark meat as bait, and a probable use established for a fishery product that had hitherto been wasted. The United States National Museum, upon invitation from this Bureau, also took advantage of an unusual opportunity to add to its natural history collections. The survey must be ex-



tended into the next fiscal year before it can reach a stage of completion.

Each important vessel, where engaged in other primary investigations, has taken advantage of the opportunities for recording hydrographic observations as far as consistent with the economical prosecution of its immediate objects. Thus data of some value have been reported by the steamer *Albatross* while pursuing special studies of the western coast and by the steamer *Fish Hawk* while working off the coast of North Carolina.

#### STUDIES OF ANADROMOUS FISHES.

Among the most highly esteemed of our food fishes are those that spend the greater part of their lives in the ocean, but at one stage enter the rivers for the purpose of reproduction. Such are the salmons, the striped bass, the shad, and the sturgeons. Crowding as they do at one particular season into certain restricted channels, namely, the river courses of our coastal slopes, they become the more readily an easy prey to man's pursuit. Unless the greatest foresight and restraint are exercised in the fishery, and the methods of artificial propagation are resorted to, such fishes are certainly doomed to rapid diminution, if not complete disappearance. The absolute abundance of anadromous fishes is too easily overestimated. Take all the shad which even in past times entered our rivers and strew them widely over both land and water of the coastal plain, and their "abundance" would be lost to view; or, as may indeed be done in nature, scatter them over the continental slope beneath the ocean waters and they become one of the rarer fishes of the sea. There is little reason to wonder that a shad is so seldom taken in the ocean fishery followed off the greater portion of our coast. It would have to be an extraordinary condition, such as abundant food, perhaps, that would bring shad together in a particular region of the sea, that would permit an ocean fishery for shad to be carried on. Such, indeed, appears to be the case of certain regions off the northeastern coast where "sea-run shad" become a feature of the local markets. What is the origin of such shad? Are they a distinct race, or are these the shad that were bred in southern rivers? The extent and directions of migration of the fish are questions of vital interest. To what extent are the runs of one river affected by fishing operations in another? In what degree does artificial propagation in one stream yield returns of value to another? These are all kindred questions or aspects of one general problem for each anadromous species.

Notwithstanding the attention which has been devoted to the shad during so many years, the paucity of explicit knowledge is keenly felt. Early in the fiscal year the Bureau instituted a comprehensive investigation of the shad, hoping that the application of newer methods of investigation may afford the key by which the mysteries may be unlocked. Beginning with the St. Johns River in Florida in January, the investigator has worked up the coast, visiting the principal shad streams as nearly as possible at the time when the fish are arriving from the sea. By the close of the fiscal year he had reached New England, where studies were being made both of the native shad of Maine and the sea shad of the waters north of Cape Cod. Many questions have received attention,

although the primary purposes have been to determine if shad of different rivers or of different brood regions present distinguishable racial differences and to obtain information as to the extent of the coastwise movements of the fish. Many data have been accumulated and many specimens secured, all of which must form the basis of subsequent detailed studies before exact conclusions can be drawn.

Associated with the shad and herring and having similar habits is the glut herring, a species of considerable abundance but one which until recently found only a limited market in the localities in which taken. The past few years have witnessed a marked increase in value and diminution in numbers. During the past season experiments were made by an assistant in cooperation with fish culturists to ascertain the best methods of handling and hatching the eggs, and the results have indicated that the artificial propagation of the species on a large scale is feasible.

The detailed study of the life history of the salmon of the Sacramento and Columbia Rivers has been continued and the field work is practically concluded. With the study of accumulated data and the preparation of the report during the ensuing fiscal year, it is expected that conclusions will be reached that will guide our fish-cultural operations to a stage of greater efficiency. In the direction of these studies the investigator has had not only the benefit of the most expert counsel but the sympathy and suggestions of practical fish culturists.

#### INVESTIGATIONS RELATING TO FRESH-WATER FISHES.

The field of fresh-water fish investigations has been too little touched, although the immediate opportunities of domestic fish culture are probably greatest among fresh-water forms. No one assumes that the great complex of streams and abundant lakes and ponds are productive to their maximum capacity, but rarely is due care taken to conserve in practicable ways the conditions in them favorable to the growth and propagation of fish. This phase of the general problem of fish production is not yet adequately realized nor are the principles satisfactorily developed.

That the streams, lakes, and ponds should be stocked and restocked with fish is an ever growing demand which indicates the widespread interest in such fisheries, whether they serve as a means of recreation or as a source of food. The stocking and restocking of waters is, however, not usually the principal desideratum. In specific instances the actual condition to be relieved may be due to an over-abundant stock. Just as agriculture has long since passed the stage where increased production is sought primarily through the planting of more seed in a given area, so it is incumbent to give proper attention to promoting a favorable condition for the growth of fish, looking intelligently to the maintenance of suitable condition of physical environment, abundance of food, proper association of species, and a correct proportioning of numbers and variety of fishes to the biological capacity of the water.

The fishery problems of fresh water are undoubtedly simpler than those of the seas, but they are certainly less directly approachable than the problems of agriculture which have met their solutions. It is not surprising, therefore, that, throughout the country in mat-

ters of fish culture, there is as yet too little serious endeavor to find real causes or to apply appropriate remedies. Year by year the Bureau is devoting more careful and fitting attention to the problems of fresh-water fisheries, and some of its principal activities in this field may be referred to.

The problem of fish culture, at least as referring to pond fishes, is primarily one of food supply. Our knowledge of the food of fishes is as yet seriously inadequate. The food taken by fishes varies with the species, with size and age of the fish, with the season of the year, and with the abundance of the various kinds of food materials present in different bodies of water. A few observations in one locality or at one season of the year afford no criterion for the conclusions that we may seek to draw, for an appraisal of the possibilities of fish production in any body of water, for an understanding of the variations in the sizes attained by a given species of fish in different bodies of water, and for the direction of our efforts to promote an abundant and reasonably constant supply of food under all conditions subject to control.

One of the investigations of the food of fishes that has been pursued comprises an examination of a number of perch taken from each of two lakes in Wisconsin during each week in the year. At the same time collateral studies have been made of the food of many of the important fishes, their habits and interrelations. Some of the results have been submitted for publication, while other reports are in preparation. The accumulation of such data is not of theoretical interest; it is indispensable to a purpose, for it must lead eventually to intelligent conclusions as to the highest possibilities in rearing fishes and the methods of realizing such possibilities.

At the Fairport station several special fish-food studies are being actively pursued. In connection with the experiments in rearing buffalofishes, examinations are systematically made to determine the food taken at all sizes and all stages. Investigation of the food of all small fishes in the experimental ponds are being conducted in connection with parallel studies of the available foods in the ponds. Systematic studies are being made of the aquatic insect life. Experiments are also being directed at the problem of promoting an abundant growth of food organisms by methods of fertilizing the water or otherwise.

The investigation of the habits and movements of fishes in the Mississippi River with especial reference to the obstruction of the river by the dam at Keokuk has been continued throughout the fiscal year. Only tentative conclusions have as yet been reached, but the progress of the investigation has been such that it may be hoped to present a full report within another year.

Within the year there has been completed a report embodying the results of an earlier investigation of the Rangeley Lakes of Maine. These have for many years been among the more widely known for their game fishes, and the investigation was undertaken to gain information that might serve not only as a guide to fish-cultural development of these particular waters but as a basis for the adoption of a proper policy with regard to other lakes. The report comprises an unusual body of information regarding the habits and relations of many important food and game fishes.

There is in progress and now drawing to a conclusion an investigation of the habits of the common smelt, a fish which is of no little economic importance, partly as an object of fishery itself and more significantly as a source of food for the larger food and game fishes.

It is generally known that many species of fish are destructive to the larvæ of mosquitoes, but, where public health is involved, it becomes of high importance to know definitely what fish are most effective in mosquito extermination and under what conditions is their efficiency greatest. In many cases, where the usual treatments of waters are impracticable because of expense or other sacrifice involved, it is convenient to rely upon the agency of small fish, provided there can be assurance that the result sought will be fully accomplished. It is possible that in particular cases partial failure to eliminate all mosquito larvæ can be turned into complete success through the introduction of other kinds of fishes that will be adapted to the particular condition of the pond or through measures taken to so change those conditions that the fish will have a better chance to obtain their prey. It is necessary then to study the comparative efficiency of the different species of fish and to ascertain how the efficiency of the more suitable species is affected by the various conditions of depth, vegetation, and débris.

At the beginning of the fiscal year the Bureau issued an economic circular giving an account of the various species of fish that play an important part in mosquito extermination and at the same time it entered into cooperation with the Bureau of Entomology for a careful investigation directed to the ends just stated. The inquiry will be continued through the next fiscal year.

In addition to its functions in mussel culture, and without hindrance to them, the Fairport station is being utilized effectively in fish-cultural experimental work. Some of these experiments are being conducted with the game fishes that are favorite objects of cultural efforts. The purpose of these experiments is primarily to ascertain the conditions under which the fish may be reared to a market size in greatest numbers.

During the spring of 1915 unusual success was attained in the hatching of the eggs of the buffalofish after artificial fertilization. A number of the fry were placed in a new station pond to be kept under observation. Notwithstanding the raw state of the pond and other unfavorable conditions, more than 25 per cent of the fish, or about 45,000, were found to have survived when the pond was drawn in the fall, and some had attained a length of over 6 inches. A good many of the fingerlings were liberated and others were retained for further growth. A proportion of loss was experienced during the winter season, but the experiments are still in progress. Not all has been obtained that would be desired, but, as the first attempt at rearing buffalofish in captivity, the success is such as to recommend the continued experimentation with a form that is well known as a commercial food fish of large size and of diminishing abundance.

Quite interesting results have been attained too with the channel catfish (*Ictalurus punctatus*), a form that has hitherto baffled all attempts at propagation. Just at the close of the fiscal year the first successful attempt at propagation was in progress, but the further history of the experiment is a matter for a later report.

The Bureau is continually called upon for advice in the solution of problems confronting those who are either engaging in fish culture as a private venture or who are interested in developing the possibilities of certain public waters. A station such as that at Fairport, where the hatching and rearing of fishes to a size suitable for the table can go hand in hand with systematic scientific observation and experiment, renders a long needed and invaluable service in providing an experience supplemental to that gained in practical fish-cultural work.

During the year the Bureau conducted a survey of the Bonneville System of Utah with reference primarily to its fishery resources and incidentally to the problems of fish protection in irrigation ditches. This system comprises Utah Lake and Provo, Beaver, Bear, Logan, and other rivers. Interesting and unexpected discoveries were made of several new species of whitefish that appear to be indigenous to the system, and all of which are good food fish. Utah Lake is famous for its suckers and carp, tons of which are sometimes shipped to eastern markets, some going even to New York. Generally speaking, however, the fish of the Bonneville System are not plentiful enough to be of great commercial value except locally. With the development of power plants and the growth of agriculture, they are certain to become less numerous, unless due care is taken to conserve the fish supply as far as may be done consistently with the pursuit of other objects of greater economic importance.

#### SERVICE OF THE BIOLOGICAL LABORATORIES.

The seaside laboratories, which opened for the summer season just before the close of the last fiscal year, were in active operation until about the middle of September, 1915. Various investigations were pursued chiefly through the employment of the temporary services of specialists in several lines.

The Woods Hole, Mass., laboratory is intended to serve as a nucleus for investigations of more direct reference to the New England and Middle Atlantic fisheries as well as for more technical investigations of general application. In some respects this establishment is better adapted for technical studies than any other laboratory of the Bureau, and it is hoped to improve the facilities for biophysical and biochemical studies that form essential phases of certain fishery investigations. The lack of a permanent scientific staff for this station causes its scientific operations to be confined largely to the summer season, when temporary professional services are most readily available. The principal topics of investigation during the past season may be cited. There have been studies of oysters, elsewhere referred to, which related chiefly to nutrition, greening, and propagation. The studies of nutrition had especial reference to the discovery of methods of fattening that might not be open to the objections properly raised against some of the common practices. The investigation of greening, directed at a condition which has served as a serious blight on oyster culture in certain localities, and of "green gill," an entirely distinct phenomenon, was also associated with this laboratory. Studies of the larval development of fishes have been followed with results narrated elsewhere.

Other subjects of investigation were the parasites of fishes and the effect of such parasites upon the vitality of the individuals; the effect upon fishes of certain mineral salts which may be present either as a normal constituent of some spring waters or as a consequence of pollution; the metabolism of fishes and oxygen utilization, subjects which have a bearing upon the propagation and rearing of fishes; the bacteriology of fishes; the biology and the utilization of sea mussels; and the possibilities of utilization of other waste fishes. As usual the facilities of the laboratory were extended to a few independent investigators whose studies were pursued without expense to the Bureau.

The Beaufort, N. C., laboratory is a center for investigations that look to the better development of the fisheries of the South Atlantic coast. Allusion has been made to the study of the mullet and to the survey of fishing grounds which has revealed opportunities for offshore winter operation and contributed to the development of a fishery that is as yet unduly limited. The successful experiments in terrapin culture are also more fully described elsewhere. Special attention is being devoted to the breeding habits of fishes, the larval development of fishes, and, as opportunity offers, to the possibilities of propagation of certain sea fishes which support important fisheries in the South Atlantic States. Interesting observations were made and a report was prepared dealing with the habits of certain species of small fish that are denizens of brackish and fresh waters and that are serviceable in the extermination of mosquito larvæ and hence in the maintenance of public health.

Efficient study of the food of fishes and of the movements of fishes, as directed by the search for food, or the avoidance of enemies, demands an exact knowledge of the forms of animal and plant life which may be encountered in the local waters or which may be found in the stomachs of the fishes. Careful systematic studies of certain groups of animal and plant life have therefore been in progress for some time. During the past fiscal year there was completed for publication a valuable report on the sharks and rays of the Beaufort region; and another comprehensive report dealing with the decapod crustacea, a group that includes the crabs and other forms of most direct economic usefulness, has also been completed and submitted for publication. Systematic studies of certain groups of fish parasites have been completed. A report of the algæ of the region is nearing completion, while the diatoms and protozoa, among the lowest forms of minute plant and animal life, as well as the higher fishes, are now subjects of investigation.

In the assurance that the development of commercial fisheries will soon demand more strongly the conservation of important shellfish, serious attention is being given to the life history of the quahaug or hard clam and the principal crustacean forms.

The Beaufort laboratory has also been found a favorable place for the prosecution of certain special problems that have not a particular regional significance. At this place there are pursued investigations of the toxicity of certain chemicals to marine borers and of the protection of wood against these disastrous pests, in which studies the Bureau has enjoyed the cooperation of the forest products laboratory of the Forest Service and the sympathetic interest of railway companies and other commercial bodies.

The enlargement of the island upon which the laboratory is located, in consequence of the deposition of material dredged by the War Department from nearby channels; the recent additions to the building authorized by Congress; and the grading and sodding of large portions of the island have added greatly to the appearance and to the stability of the property. The station would be of much greater practical service to the fishing industries of the coast were it enabled, through the provision of an adequate permanent staff, to carry on more extensive permanent experimental work. Investigations temporarily pursued serve a useful purpose in laying the basis for practical work, but it is usually only through continuous experimentation that the inevitable difficulties of new practical work are discovered and successfully overcome, as must finally be done to pave the way to substantial benefits. The terrapin experiments offer a concrete example of a businesslike mode of procedure in fishery experiment work, while other opportunities are awaiting with perhaps greater possibilities.

The Key West, Fla., laboratory becomes nearer to realization with the developments of the past fiscal year, during which the Government has assumed title to the site and Congress has provided the necessary additional appropriation for its construction. The preliminary sketch plans were completed and at the close of the year the final plans were in course of preparation. Bids are expected to be sought by advertisement at no distant date. The laboratory site is properly chosen near a base of supplies accessible by water and rail and the seat of important commercial fisheries. Situated as it is, entirely remote from the influence of fresh-water rivers and on the thoroughfare from gulf to ocean, the conditions should be eminently suitable for work with marine forms. It is hoped to employ the most substantial method of construction, not only because the peculiar conditions of the geographic location demand it but because it is regarded as sound business policy to provide against the continued necessity for repairs and unnecessary operating costs.

When this laboratory is in operation and provided with a staff of trained investigators, the service rendered by the Bureau to the fisheries of the Gulf and extreme South Atlantic coasts will be of more palpable benefit. Some of the evident opportunities are to be found in the study of the artificial propagation of the green turtle, the investigation of such useful forms as the spiny lobster and the stone crab, the fostering of the struggling industry of sponge culture, and the study of the important food fishes of the Gulf of Mexico and Straits of Florida.

The Fairport, Iowa, station, having a permanent scientific staff, is in active operation during the entire year. During the summer season its staff is temporarily augmented in order that particular problems arising from the regular investigations at this station or related to the other activities of the Bureau may be attacked by specialists in particular lines of study. As at the marine laboratories, the facilities of the station are extended to approved independent investigators, who, as table occupants, pursue their researches without cost to the Government.

The propagation of mussels, the fish-cultural experiment work, the investigations of the food of fishes, and certain studies of conditions in the Mississippi River, as elsewhere referred to, are among the

subjects under consideration at Fairport during the year. One of the investigations pursued at this laboratory was of particular interest in establishing the fact that mussels may absorb nutritive substances in solution in the water not only through the alimentary tract but directly through the surface cells. Other studies in progress relate to the propagation of species of mussels not yet susceptible to practical cultural methods, the relations of fishes and mussels in nature, the possibilities of rearing mussels without parasitism, the food of mussels, the copepod parasites of fishes, and the constitution of the blood of fishes.

The equipment of the station in ponds and other facilities for the efficient prosecution of its work has been materially increased during the year. A bulletin descriptive of the equipment and functions of the Fairport station has just been published.

#### MISCELLANEOUS INVESTIGATIONS.

The Bureau has taken advantage of an opportunity to utilize the services of a specialist traveling abroad to secure information regarding recent significant developments in foreign pearl fisheries and expects to have a report available within the next year.

The imperative necessity for seeking new sources of potash for use in agricultural and commercial enterprises has led to the sudden development of an industry of kelp harvesting, especially in the region of San Diego, Cal. Simultaneously there arose questions as to the possible effect of the cutting of kelp upon the fisheries. Just before the close of the fiscal year it had been arranged to begin a study of the kelp fields and the method of harvesting with the view of securing definite information as to the relations of fish and shellfish to the kelp groves as they might be affected by the operations of harvesting.

For two or three years the Bureau has been searching for suitable supplies of hydroids, or the "sea moss" of commerce, which had previously been imported from Europe in considerable quantities. The dyed product is used for decorative and millinery purposes, and the importations for the only year for which statistics are available (1909) amounted to more than 300,000 pounds, valued at \$47,558. In connection with the survey of the Chesapeake Bay, considerable quantities were located at depths of 18 to 30 fathoms, and experiments were made to devise efficient methods of collecting. An experienced manufacturer accompanied the investigator on one of the cruises and pronounced the material of excellent quality. Further observations must be made to determine the seasons when the moss may be found in greatest abundance and highest quality.

One of the most serious handicaps upon the halibut fishery of the northwest coast is the occurrence of "mushy" halibut, which is especially characteristic of certain grounds and which begins to be noted in early summer, increasing in prevalence until the unmarketable fish form so large a proportion of the catch as to compel the abandonment of the fishery or the removal to other and less accessible grounds for the remainder of the season. Through the study of material supplied to a specialist in the employ of the Bureau, it has been ascertained that the "mushy" condition is caused by a minute protozoan parasite which multiplies abundantly and brings about



a degeneration of the muscle tissue. As soon as it is possible to do so, the Bureau will undertake a more extensive investigation in the field in order to learn the distribution of the parasite, the conditions that bring about its occasional increase in abundance, and any possible method of remedy or control.

The cooperative work with the State Geological and Natural History Survey of Wisconsin in an inquiry into the biological and physical conditions of life in inclosed waters has been continued. Progress has been made upon the reports of investigations of Lake Champlain and those of the lakes of Washington and Idaho.

In response to a widespread interest in the subject of frog culture, evidenced by the daily receipt of inquiries for information and advice in the matter, there is in preparation a report dealing with the natural history of frogs. Field studies are also being conducted.

An interesting test was made in connection with an experiment in rearing fresh-water mussels at the Fairport station. While the commercial mussels are native to rivers and not to still waters, some fishes which had been infected with the glochidia of mussels in the way ordinarily followed in practical operations were subsequently retained in floating crates and others were placed in station ponds. After two seasons of growth it was found possible to cut and finish buttons from the shells of these artificially propagated mussels. The rate of growth was much more rapid than had been expected. It is not assumed that mussels can be reared commercially in such waters, but the experiment is of interest and value as throwing light upon the nature of the results to be expected from the practical operation in public waters.

While the Federal Government exercises no jurisdiction over the pollutions of waters as affecting fisheries, the Bureau can render a very practical service in the investigation of reported cases of pollution where the importance of the stream and the alleged extent of the damage done is such as to warrant its taking cognizance of the matter. In some instances the reports are found to be without due foundation, while the agencies complained of are exercising all proper care. A report of the actual facts based upon a careful and unprejudiced examination of conditions serves to allay suspicions and prevent the further existence of dissatisfaction. In other cases the conditions are observed to be as alleged, but abatement is effected through a clear and convincing presentation of the facts to the offending parties, coupled with suggestions as to practical remedies and an appeal for cooperation. Again, there may be encountered those who are carelessly permitting industrial wastes to render a stream uninhabitable for the more desirable fishes and who are not amenable to reasonable suggestions. In such cases the findings of the Bureau can still serve a useful purpose in directing public attention to a wanton abuse and in reinforcing those who may be interested to seek relief by process of law. The Bureau has within the year conducted a number of investigations of this kind and the reports have been placed as promptly as possible in the hands of the parties interested.

## COMMERCIAL FISHERIES.

Investigations completed by the Bureau during the year, in addition to the work of local agents in collecting data for important vessel fisheries on the Atlantic and Pacific coasts, included canvasses of the fresh-water mussel fishery of the Mississippi River and its western tributaries from Kansas northward; the fisheries of Lakes Pepin and Cooper in the Mississippi River, the former between Minnesota and Wisconsin, and the latter at Keokuk, Iowa; the crab industry of Maryland and Virginia; the shad and alewife industry of Chesapeake Bay and tributaries; the coastal fisheries of New York and New Jersey, exclusive of shellfish, for 1915; and the shad fishery of the Hudson River for 1915 and 1916. The inquiries relating to the fresh-water mussel fishery in the region referred to, and those relating to the shad and alewife industry, were begun the latter part of the preceding fiscal year.

## FRESH-WATER MUSSEL FISHERY.

The general canvass of the fresh-water mussel fishery, which has been in progress for several years, was completed during the past year. The streams covered were the Mississippi River and its western tributaries from Kansas northward, except the Neosho River in Kansas, which was included in the work of a previous year; and the data collected were for the calendar year 1914. A special bulletin giving the results of the canvass was issued and distributed. The number of persons engaged in the mussel fishery in these streams in 1914 was 1,873, and the investment in boats, fishing apparatus, and shore and accessory property amounted to \$132,267. The products included 8,539 tons of shells, valued at \$148,960, and pearls found in the mussels to the value of \$62,902, a total of \$211,862. All the shells were used in the manufacture of pearl buttons. The principal fishing apparatus used in taking mussels is the crowfoot bar, the catch with this appliance in this region amounting to 6,524 tons of shells, valued at \$120,859. The remainder of the catch was taken with forks, rakes, diggers, tongs, scoops, or basket rakes, and by hand while wading.

*Mississippi River.*—The most important of these streams is the Mississippi River, the products of which amounted to 6,626 tons of shells, valued at \$125,948, and \$50,562 worth of pearls, a total of \$176,510 in value. This shows a decline of about 58 per cent in quantity and 61 per cent in value of the output of shells and pearls since 1903, the last previous year for which data are available. In view of the fact that the mussel fishery has been prosecuted in the Mississippi River for nearly 25 years, the decline in the output is not so surprising. Nearly 94 per cent of the river's catch in 1914 was taken with crowfoot bars, and of the remainder 2 per cent were taken with forks, 2 per cent with rakes, and 2 per cent with diggers and tongs. Fishing with crowfoot bars is more vigorously prosecuted in Lake Pepin than in any other portion of the river. In many cases two rowboats or scows are connected by a bar or pole 10 to 15 feet long, a gasoline boat pushing against the middle of the bar being used as the propelling power. The two small boats are provided with 4 crowfoot bars, 3 of which are being fished while the

fourth is having the mussels removed from it. Usually two men, but occasionally only one man, handle such an outfit.

Mussel fishing on this river in 1914 was followed from Pine Bend, about 20 miles below St. Paul, Minn., to the mouth of the Missouri River, near Alton, Ill., the fishing ending abruptly at that point. A few shells have been taken as far up the river as Bemidji, Minn., but no sale of them has ever been made. Probably the most productive portion of the river in 1914 was in the vicinity of Frontenac, Minn., where, within a few miles, the 45 men engaged caught 645 tons of shells, valued at \$10,570, and \$2,100 worth of pearls and slugs. The beds near Maiden Rock, Wis., were also quite profitable, the output of 36 men amounting to 390 tons, valued at \$6,630, and \$2,100 worth of pearls. Lake Pepin as a whole produced 1,932 tons of shells, valued at \$31,486, and \$11,820 worth of pearls. It is said that there were at least 1,000 men fishing for mussels in Lake Pepin in 1911, the catch amounting to about 4,000 tons, compared with an output of less than 2,000 tons in 1914 taken by 281 fishermen.

In 1900, when the first mussel fishing was done at Red Wing, Minn., there were said to have been 75 boats at work on the beds there, compared with 8 boats in 1914. The first mussel fishing at New Albin, Iowa, was in 1899, when there were at least 20 men working on the beds, which yielded an average day's catch per man of several thousand pounds, compared with 150 to 200 pounds now. In the early days of the fishery very few shells other than nigger-heads were saved. As recently as 1910 as many as 70 or 80 men worked on the mussel beds opposite New Boston, Ill., while in 1914 only 15 men were engaged and small catches were made. There were 15 or 18 mussel fishermen out of Quincy, Ill., in 1900, while in 1915 there were none, this being due both to overfishing and to the building of dams and dikes by the Government to preserve the channel of the river. Similar changes have taken place at Canton, Mo., where a button factory is located, but the shell supply is obtained from various parts of the Mississippi Valley. The mussel beds in the vicinity of Prairie du Chien a few years ago were the most prolific by far of any in the entire river, but in 1914 the catch of 100 men in that vicinity amounted to only 385 tons, valued at \$6,872, and \$5,500 worth of pearls and slugs.

A great decline has taken place also in the beds near Muscatine, Iowa, where the industry was first established in 1891. The near exhaustion of the beds in this vicinity has caused many of the local fishermen to seek unworked mussel streams in various parts of the country.

The catch of the Mississippi River as a whole was divided among the different species approximately as follows: Niggerheads, 25 per cent; three-ridges (including blue-points), 23 per cent; wartybacks, 13 per cent; muckets, 13 per cent; pig-toes, 6 per cent; washboards, 6 per cent; pocketbooks, 3 per cent; yellow sand-shells, 2 per cent; Missouri niggerheads, 2 per cent; pistol-grips, 2 per cent; and monkey-faces, 1 per cent. The remaining 4 per cent consist of black sand-shells, ladyfingers, bullheads, and a few other unimportant species.

*Cedar River.*—The catch of this river was apportioned among the different forms of apparatus as follows: 54 per cent with forks, 22 per cent with hands while wading, 18 per cent with crowfoot bars, and the remainder with rakes. Muckets predominated in the catch,

with a percentage of 57. The remainder was divided as follows: Three-ridges and blue-points, 18 per cent; pocketbooks, 10 per cent; warty-backs, 3 per cent; pigtoes, 1 per cent; and a few each of pistol-grips, black sandshells, butterflies, maple-leaves, and other unimportant species.

A few pearls and slugs were taken from this river as far up as Osage, Iowa, in 1914, but Charles City, Iowa, and vicinity was the upper limit of shell fishing. The most productive beds were in the vicinity of Cedar Rapids. This was also the lowest point on the river where shells were taken. The catch of 15 men in that locality amounted to 130 tons, valued at \$2,020, and \$975 worth of pearls and slugs.

The first mussel shells were taken for market from this river in 1905 near Vinton, where a button factory was established about that time and operated for several years.

*Des Moines River.*—More than 75 per cent of the river's output is taken between Ottumwa, Iowa, and about 15 miles below that city. Forty-five tons of shells were taken from the east fork of the river as far north as between Bert and Bancroft, this being the first year in which work was done on that branch of the river. The lowest point at which shells were taken was near Keosauqua, Iowa, an output of 17 tons being shown for that vicinity. The prevailing species were three-ridges (including blue-points), warty-backs, muckets, and pigtoes, with percentages of 45, 18, 15, and 13, respectively. The remainder was made up of pistol-grips, maple-leaves, monkey-faces, lady-fingers, pocketbooks, etc. About 63 per cent of the catch was made with forks, 29 per cent with hands while wading, and the remainder with rakes. The first record of any shells being taken from this river was near Keosauqua in 1910.

*James River.*—This river, said to be the longest unnavigable river in the United States, supported mussel fisheries from Riverside, S. Dak., to within a few miles of its mouth—Yankton, S. Dak. The most prolific beds were between Milltown and Olivet, S. Dak., and those located a few miles above and below Yankton. The total output of the river in 1914 amounted to 260 tons, valued at \$3,498, and \$700 worth of pearls and slugs. Twenty-seven persons were engaged in the fishery and had an investment of \$1,460, including apparatus, boats, and shore property. About 90 per cent of the catch was taken with scoops, or basket rakes, and the remainder with forks and by hand. The output was composed of 85 per cent three-ridges (including blue-points), 10 per cent fat muckets, and the remainder maple-leaves, pocketbooks, and heel-splitters. The first record of any mussel fishing being done in the James River was in 1912. Pearls, however, were taken several years previously.

*Osage and Marais des Cygnes Rivers.*—The Osage and Marais des Cygnes Rivers are treated as one, the latter being the name given to that portion of the river flowing through Kansas. Forty men, with an investment of \$1,261, were engaged in shelling on this river from near Trading Post, Kans., as far down as Warsaw, Mo. The total output in 1914 amounted to 204 tons of shells, with a value of \$2,111, and \$380 worth of pearls. About 37 per cent of the catch was made with forks, 26 per cent with hands while wading, 22 per cent with crowfoot bars, and the remainder with diggers and tongs. The output was apportioned among the different species as follows: Three-

ridges (including blue-points), 43 per cent; washboards, 17 per cent; pig-toes, 15 per cent; muckets, 12 per cent; and a few each of warty-backs, monkey-faces, lady-fingers, pistol-grips, maple-leaves, and butterflies. The most prolific beds were those between Warsaw and 55 miles above that town, 22 men working on these beds obtaining 110 tons, with a value of \$1,540, and \$100 worth of pearls.

*Wapsipinicon River.*—Mussel fishing on this river in 1914 extended from Independence as far down as Anamosa, Iowa. The total output was 132 tons, valued at \$1,797, together with \$765 worth of pearls and slugs. The 37 persons engaged had an investment, in apparatus, boats, and shore property, of \$811. More than 50 per cent of the catch was made with forks, the remainder being taken by hand while wading, and with crowfoot bars, and rakes. The catch was divided among the different species as follows: 71 per cent muckets, 15 per cent blue-points and three-ridges, 10 per cent pocketbooks, and the remainder warty-backs, squaw-foots, pig-toes, and heel-splitters. The first mussel fishing on this river of which there is any record was in 1908.

*Iowa River.*—The total output of this river in 1914 was 93 tons of shells, valued at \$1,038, and \$2,975 worth of pearls and slugs. The 86 persons engaged had an investment of \$345 in apparatus, \$500 in boats, and \$300 in shore property. More than one-half of the shells were taken with hands while wading, about 25 per cent with forks, and the remainder with crowfoot bars and rakes. The shells were apportioned among the various species as follows: 42 per cent muckets, 30 per cent pocketbooks, 20 per cent three-ridges (including blue-points), and the remainder divided among warty-backs, squaw-foots, pistol-grips, black sand-shells, maple-leaves, pig-toes, lady-fingers, heel-splitters, and butterflies. Pearls were found as far up the river as Popejoy, but the upper limit of mussel fishing was near Eldora, from which place it was followed at intervals as far down the river as North Liberty. The first mussels for commercial use were taken from this river in 1908.

*Minnesota River.*—Mussels were taken at intervals along this river in 1914 from Montevideo, Minn., to within a short distance of its mouth, the total output amounting to 118 tons of shells, valued at \$1,254, and \$455 worth of pearls. The 13 men engaged had \$120 invested in apparatus, \$280 in boats, and \$145 in shore property. The most important catch was made in the vicinity of New Ulm, Minn. The entire output of the river was taken with crowfoot bars, and was composed of 56 per cent three-ridges (including blue-points), 27 per cent muckets, 6 per cent washboards, 5 per cent warty-backs, and a few each of niggerheads, pig-toes, and pistol-grips. The first commercial fishing in the Minnesota River was done near its mouth in 1905 by a few fishermen from the Mississippi River, who remained only a short time. Work was followed up more steadily from 1909.

*Meramec River.*—Mussel shells were taken from the Meramec River in 1914 at various localities between St. Clair and Valley Park, Mo., the total output amounting to 90 tons, valued at \$830, and \$465 worth of pearls and slugs. The 30 fishermen engaged had an investment of \$280 in apparatus, boats, and shore property. Nearly nine-tenths of the mussels were taken by hand and the remainder with crowfoot bars. Muckets composed about 43 per cent, three-ridges

26 per cent, washboards 8 per cent, and warty-backs and pistol-grips, or buckhorns, 7 per cent each of the catch, the balance being made up of pig-toes, niggerheads, maple-leaves, and monkey-faces. The first commercial fishing on this river was in 1910.

*Blue River.*—Some mussel fishing was done on this river near Beatrice, Nebr., in 1914, a total catch of 55 tons of shells, valued at \$770, being reported.

*South Skunk River.*—The 5 fishermen on this river caught 43 tons of mussel shells, valued at \$602, and \$310 worth of pearls and slugs from the South Skunk River near Oskaloosa, Iowa, in 1914. Some shells were taken from the Skunk River proper in 1913, but none in 1914.

*Shell Rock River.*—Mussels were taken from this river between Marble Rock and Shell Rock, Iowa, the total output, however, being only 32 tons, valued at \$354, and \$210 worth of pearls and slugs. Only 6 men were engaged on the entire stream in 1914. One-half of the catch was made with forks, and the remainder with hands, crow-foot bars, and rakes. The different species were found in the following proportions: Pocketbooks, 47 per cent; muckets, 43 per cent; blue-points, or three-ridges, 8 per cent; and a few squaw-foots. No shelling was done on the river previous to 1908.

*Cottonwood and Bourbeuse Rivers.*—The two remaining streams in the region canvassed were the Cottonwood and Bourbeuse Rivers. Shells were taken on the former river at Cottonwood Falls, Kans., and on the latter near St. Clair, Mo., the combined catch of the two rivers amounting to 65 tons, valued at \$430, and \$60 worth of pearls and slugs.

*Statistics of the mussel fishery.*—Complete statistics for all of the mussel-bearing streams of the Mississippi Valley show a total of 10,331 persons engaged in the fishery, an investment of \$540,608, and a catch of 51,571 tons of shells, valued at \$825,776, together with \$376,284 worth of pearls and slugs; the total value of the products amounting to \$1,202,060. Statistics of the mussel fishery of the Mississippi River and its western tributaries from Kansas northward for 1914, and of the entire Mississippi Valley in three sections for 1912, 1913, and 1914, respectively, are given in the following tables:

FRESH-WATER MUSSEL FISHERY OF THE MISSISSIPPI RIVER AND ITS WESTERN TRIBUTARIES FROM KANSAS NORTHWARD IN 1914.<sup>a</sup>

Items.	Blue River, Nebr., and Cottonwood River, Kans.		Cedar River, Iowa.		Des Moines River, Iowa.		Iowa River, Iowa.		James River, S. Dak.		Meramec and Bour- beuse Rivers, Mo.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Persons engaged:												
Fishermen.....	7		80		31		86		27		32	
Shoresmen.....			10									
Total.....	7		90		31		86		27		32	
Fishermen, classified by meth- ods used:												
Crowfoot bars.....			25				20				4	
Forks.....			77		31		85		2			
Rakes.....			6		3		40					
Diggers or dredgers.....												
Tongs.....									25			
Scoops, or basket rakes.....									2			
Waders.....	7		60		30		86				32	
Total, exclusive of dupli- cation.....	7		80		31		86		27		32	
Boats:												
Rowboats.....	7	\$55	74	\$660	31	\$295	82	\$500	13	\$245	28	\$130
Gasoline boats.....			3	265					9	995		
House-boats.....												
Total.....	7	55	77	925	31	295	82	500	22	1,240	28	130
Apparatus:												
Crowfoot bars.....pairs.....			25	365			20	200			2	20
Forks.....			77	103	31	44	85	115	2	3		
Rakes.....			6	6	3	2	40	30				
Diggers or dredgers.....												
Tongs.....												
Scoops, or basket rakes.....									15	67		
Total.....				474		46		345		70		20
Shore and accessory property.....		10		565		375		300		220		150
Total investment.....		65		1,964		716		1,145		1,530		300
Products:												
Shells—												
With crowfoot bars.....tons.....			87	994			10	110			10	90
With forks.....do.....			261	3,316	211	2,777	23	256	20	240		
With rakes.....do.....			20	285	25	325	10	110				
With diggers or dredgers, tons.....												
With tongs.....tons.....												
With scoops, or basket rakes.....tons.....									232	3,162		
With hands.....do.....	110	1,120	117	1,331	100	1,300	50	562	8	96	90	820
Total.....	110	1,120	485	5,926	336	4,402	93	1,038	260	3,498	100	910
Pearls.....		100		3,665		2,305		2,975		700		475
Total value of products.....		1,220		9,591		6,707		4,013		4,198		1,385

<sup>a</sup> Not including the Neosho River, shown in another table.

FRESH-WATER MUSSEL FISHERY OF THE MISSISSIPPI RIVER AND ITS WESTERN TRIBUTARIES FROM KANSAS NORTHWARD IN 1914<sup>a</sup>—Continued.

Items.	Minnesota River, Minn.		Mississippi River.		Osage and Marais des Cygnes Rivers, Mo. and Kans.		Shell Rock and South Skunk Rivers, Iowa.		Wapsipicon River, Iowa.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Persons engaged:	13		1,383		39		11		35		1,744	
Fishermen.....			115		1		1		2		129	
Shoresmen.....												
Total.....	13		1,498		40		12		37		1,873	
Fishermen, classified by methods used:												
Crowfoot bars.....	13		1,364		8		3		15		1,452	
Forks.....			48		25		10		35		313	
Rakes.....			33				5		2		89	
Diggers or dredgers.....			9		2						11	
Tongs.....			14		10						24	
Scoops, or basket rakes.....											25	
Waders.....					17		5		29		208	
Total, exclusive of duplication.....	13		1,383		39		11		35		1,744	
Boats:												
Rowboats.....	9	\$95	734	\$12,360	32	\$205	10	\$80	35	\$235	1,055	\$14,860
Gasoline boats.....	3	185	731	72,755	2	650			1	100	749	74,950
House-boats.....			55	6,595							55	6,595
Total.....	12	280	1,520	91,710	34	855	10	80	36	335	1,859	96,405
Apparatus:												
Crowfoot bars.....pairs.....	10	120	1,405	16,816	8	80	3	39	15	200	1,488	17,840
Forks.....			48	103	25	31	10	13	35	44	313	456
Rakes.....			23	51			5	4	2	2	79	95
Diggers or dredgers.....			32	164	2	10					34	174
Tongs.....			14	70							14	70
Scoops, or basket rakes.....											15	67
Total.....		120		17,204		121		56		246		18,702
Shore and accessory property.....		145		14,795		285		85		230		17,160
Total investment.....		545		123,709		1,261		221		811		132,267
Products:												
Shells—												
With crowfoot bars, tons.....	118	1,254	6,216	117,238	45	630	13	168	25	375	6,524	120,859
With forks..... tons.....			149	3,308	75	730	41	526	72	985	852	12,138
With rakes..... do.....			132	3,049			11	150	8	100	206	4,019
With diggers or dredgers..... tons.....			85	1,393	20	280					105	1,673
With tongs..... do.....			44	960	10	140					54	1,100
With scoops, or basket rakes..... tons.....											232	3,162
With hands..... do.....					54	331	10	112	27	337	566	6,009
Total.....	118	1,254	6,626	125,948	204	2,111	75	956	132	1,797	8,539	148,960
Pearls.....		455		50,562		380		520		765		2,902
Total value of products.....		1,709		176,510		2,491		1,476		2,562		211,862

<sup>a</sup> Not including the Neosho River, shown in another table.



## FRESH-WATER MUSSEL FISHERY OF THE MISSISSIPPI VALLEY.

Items.	Streams tributary to Gulf of Mexico from Ohio River southward in 1912. <sup>a</sup>		Streams tributary to Great Lakes and Ohio and Mississippi Rivers north of the Ohio and east of the Mississippi River in 1913. <sup>b</sup>		Mississippi River and its western tributaries from Kansas northward in 1914. <sup>c</sup>		Total. <sup>d</sup>	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Persons engaged:								
Fishermen.....	4,665		3,337		1,744		9,746	
Transporters.....	91						91	
Shoresmen.....	110		255		129		494	
Total.....	4,866		3,592		1,873		10,331	
Fishermen, classified by methods used:								
Crowfoot bars.....	2,793		2,216		1,452		6,461	
Forks.....	364		1,116		313		1,793	
Tongs.....	1,232		513		24		1,769	
Diggers.....			140		11		151	
Dredgers.....	43		63				106	
Rakes.....	21		93		89		203	
Scoops, or basket rakes.....			13		25		13	
Miscellaneous apparatus.....							13	
Waders.....	1,051		944		268		2,263	
Total, exclusive of duplication.....	4,665		3,337		1,744		9,746	
Boats and vessels:								
Rowboats and barges.....	4,276	\$26,631	2,199	\$16,712	1,055	\$14,860	7,530	\$58,203
Gasoline boats.....	446	59,545	1,031	87,320	749	74,950	2,226	221,815
House-boats.....	579	46,900	115	14,610	55	6,595	749	68,195
Vessels transporting.....	25	56,265					25	56,265
Total.....	5,326	189,431	3,345	118,642	1,859	96,405	10,530	404,478
Apparatus:								
Crowfoot bars..... pairs.....	2,795	31,896	2,212	24,395	1,488	17,840	6,495	74,131
Forks.....	364	427	1,103	1,441	313	456	1,780	2,324
Tongs.....	1,245	7,321	513	2,796	14	70	1,772	10,187
Diggers.....			102	658	34	174	136	832
Dredges.....	19	1,500	36	63			55	1,563
Rakes.....	21	58	85	119	79	95	185	272
Scoops, or basket rakes.....					15	67	15	67
Miscellaneous apparatus.....				9				9
Total.....		41,202		29,481		18,702		89,385
Shore and accessory property.....		10,853		18,732		17,160		46,745
Total investment.....		241,486		166,855		132,267		540,608
Products:								
Shells—								
With crowfoot bars, tons.....	14,531	210,521	15,258	245,477	6,524	120,859	36,313	576,857
With forks..... do.....	1,277	15,283	3,292	55,757	852	12,138	5,421	83,178
With tongs..... do.....	3,201	55,568	790	13,559	54	1,100	4,045	70,227
With diggers..... do.....			1,733	28,200	105	1,673	1,838	29,873
With dredges..... do.....	303	5,091	225	4,500			525	9,591
With rakes..... do.....	24	379	161	2,856	206	4,019	391	7,254
With scoops, or basket rakes..... tons.....					232	3,162	232	3,162
With miscellaneous apparatus..... tons.....			34	453			34	453
With hands..... do.....	379	7,764	1,824	31,408	566	6,009	2,769	45,181
Total.....	19,715	294,606	23,317	382,210	8,539	148,960	51,571	825,776
Pearls.....		149,121		164,261		62,902		376,284
Total value of products.....		443,727		546,471		211,862		1,202,060

<sup>a</sup> From Statistical Bulletin 305. This includes Neosho River, Kans.<sup>b</sup> From Statistical Bulletin 314. This does not include tributaries of the Ohio River in Ohio, data for which were shown in Statistical Bulletin 305.<sup>c</sup> From Statistical Bulletin 343. This does not include the Neosho River, Kans., data for which were shown in Statistical Bulletin 305.<sup>d</sup> Obtained by combining statistics for the three sections of the Mississippi Valley for 1912, 1913, and 1914, respectively.<sup>e</sup> Includes 56 women.<sup>f</sup> Includes 253 women.<sup>g</sup> Includes 118 women.

## FISHERIES OF LAKE PEPIN AND LAKE COOPER.

*Lake Pepin.*—Lake Pepin, an expansion of the Mississippi River between Minnesota and Wisconsin, is nearly 25 miles long and 3 miles wide at its greatest breadth. It supports quite extensive fisheries. Pepin, Wis., is the most important town in the extent of its fisheries along the lake. Maiden Rock, Wis., also supports important fisheries.

In 1914 there were 137 fishermen engaged in the industry, their total investment amounting to \$43,599. The investment included 28 gasoline boats, worth \$7,625; 53 rowboats, valued at \$1,300; 1 houseboat, valued at \$100; 295 fyke nets, valued at \$24,995; 14 seines, valued at \$3,340; 664 anchored gill nets, valued at \$4,421; 8 trap nets, with a value of \$480; \$3 worth of lines, and \$1,335 worth of shore and accessory property. The total output of the lake amounted to 758,670 pounds of fish, with a value to the fishermen of \$33,719. Buffalofish, German carp, fresh-water drum, and catfish made up 94 per cent of the value of the entire catch. The most important apparatus used was the fyke net, known locally as hoop net. The catch therewith amounted to 337,446 pounds of fish, valued at \$18,973. The leading species included in the catch were buffalofish, fresh-water drum, German carp, suckers, and quillbacks, or white carp. Seines ranked next in importance with a catch of 291,216 pounds of fish, having a value of \$8,219. German carp and buffalofish were the two leading species taken, the value of the two being more than three-fourths that of the entire seine catch. The catch by anchored gill nets amounted to 126,198 pounds, valued at \$6,432. As in the case of seines, the principal species taken were the buffalofish and German carp. Trap nets and lines were also used, but the combined catch of the two amounted to only 3,810 pounds, with a value of \$95.

The fishery conditions on Lake Pepin have improved very much within the past 15 years by the opening up of the New York market during the winter season. Previously there was only a local demand for the fish. A considerable portion of the winter fishing is done through the ice. Comparatively few fish are handled during warm weather, as the demand is then very light. There is a close season along the lake in both Minnesota and Wisconsin from April 15 to June 15.

*Lake Cooper.*—Lake Cooper, which is merely a widening of the Mississippi River formed by back water from the dam at Keokuk, Iowa, has a length of about 50 miles.

There was a total of 105 men engaged in the fisheries of this lake during 1914. These men had an investment of \$16,190, and caught 661,135 pounds of fish, valued at \$23,300. Buffalofish, German carp, and catfish contributed 94 per cent of the value of the total catch. The most important form of apparatus used was the fyke net, known locally as bait net. The catch by this form of net amounted to 488,005 pounds, valued at \$16,210. The remainder of the catch was taken with lines and trammel nets. The most important species taken both in fyke nets and trammel nets were German carp and buffalofish. Catfish and German carp constituted the principal species taken on lines.

The form of fyke net in general use on Lake Cooper is much smaller than those used on Lake Pepin, having neither leader, wings, nor

heart, as have most of those on the latter lake. The Lake Cooper fyke nets have from 4 to 7 hoops,  $2\frac{1}{2}$  feet in diameter. There was one set in the lake opposite Sandusky, Iowa, in 1914, however, which had 9 hoops, the largest being 11 and the smallest 7 feet in diameter. The total length of this net was 57 feet.

## FISHERIES OF LAKE PEPIN AND LAKE COOPER (MISSISSIPPI RIVER) IN 1914.

Items.	Lake Pepin.		Lake Cooper.	
	Number.	Value.	Number.	Value.
Persons engaged:				
Fishermen.....	135		105	
Shoresmen.....	2			
Total.....	137		105	
Boats, apparatus, and other property:				
Gasoline boats.....	28	\$7,625	36	\$3,870
Rowboats.....	53	1,300	84	1,250
House-boats.....	1	100	10	1,075
Fyke nets.....	295	24,995	1,378	5,693
Seines.....	14	3,340		
Anchored gill nets.....	664	4,421		
Trammel nets.....			14	304
Trap nets.....	8	480		
Trot and hand lines.....		3		153
Shore and accessory property.....		1,335		3,845
Total.....		43,599		16,190
Products by apparatus:				
With seines—				
Buffalofish..... pounds.....	43,550	2,354		
Catfish..... do.....	11,785	738		
Fresh-water drum..... do.....	42,150	400		
German carp..... do.....	137,920	3,967		
Mooneye, fresh..... do.....	3,000	25		
Mooneye, smoked..... do.....	365	16		
Quillback, or white carp..... do.....	45,775	459		
Spoonbill cat, or paddlefish..... do.....	2,205	138		
Sturgeon, lake..... do.....	616	73		
Suckers..... do.....	3,850	49		
Total.....	291,216	8,219		
With fyke nets—				
Buffalofish..... pounds.....	173,450	14,068	232,585	8,615
Catfish..... do.....	10,975	743	18,415	1,258
Crappie..... do.....			50	3
Dogfish..... do.....	1,534	16		
Fresh-water drum..... do.....	85,000	1,964	21,455	642
German carp..... do.....	30,547	1,228	209,715	5,456
Mooneye, fresh..... do.....	6,300	63		
Mooneye, smoked..... do.....	1,100	54		
Quillback, or white carp..... do.....	13,305	378		
Spoonbill cat, or paddlefish..... do.....	340	19		
Sturgeon, lake..... do.....	405	50	1,095	69
Suckers..... do.....	14,490	390	4,640	164
Sunfish..... do.....			50	3
Total.....	337,446	18,973	488,005	16,210
With anchored gill nets—				
Buffalofish..... pounds.....	44,250	3,306		
Catfish..... do.....	3,760	244		
Fresh-water drum..... do.....	1,235	21		
German carp..... do.....	69,050	2,428		
Quillback, or white carp..... do.....	1,525	27		
Spoonbill cat, or paddlefish..... do.....	6,332	400		
Sturgeon, lake..... do.....	46	6		
Total.....	126,198	6,432		
With trammel nets—				
Black bass..... pounds.....			15	1
Buffalofish..... do.....			15,230	543
Catfish..... do.....			1,055	69
Crappie..... do.....			20	1
Fresh-water drum..... do.....			3,065	108
German carp..... do.....			61,885	1,408
Sturgeon, lake..... do.....			675	40
Total.....			81,945	2,170

## FISHERIES OF LAKE PEPIN AND LAKE COOPER (MISSISSIPPI RIVER) IN 1914—Con.

Items.	Lake Pepin.		Lake Cooper.	
	Number.	Value.	Number.	Value.
Products by apparatus—Continued.				
With trap nets—				
Catfish..... pounds.	235	\$15		
Fresh-water drum..... do.	3,400	65		
Total.....	3,635	80		
With trot and hand lines—				
Buffalofish..... pounds.			2,085	\$94
Catfish..... do.	75	5	52,065	3,528
Eels..... do.			3,800	250
Fresh-water drum..... do.			2,340	77
German carp..... do.			30,765	959
Pike..... do.	50	5		
Sturgeon, lake..... do.			130	12
Sunfish..... do.	50	5		
Total.....	175	15	91,185	4,920
Grand total.....	758,670	33,719	661,135	23,300
Product by species:				
Black bass..... pounds.			15	1
Buffalofish..... do.	261,250	19,728	249,900	9,252
Catfish..... do.	26,830	1,745	71,535	4,855
Crappie..... do.			70	4
Dogfish..... do.	1,534	16		
Eels..... do.			3,800	250
Fresh-water drum..... do.	131,785	2,450	26,860	827
German carp..... do.	237,517	7,623	302,365	7,823
Mooneye, fresh..... do.	9,300	88		
Mooneye, smoked..... do.	1,465	70		
Pike..... do.	50	5		
Quillback, or white carp..... do.	60,605	864		
Spoonbill cat, or paddlefish..... do.	8,877	557		
Sturgeon, lake..... do.	1,067	129	1,900	121
Suckers..... do.	18,340	439	4,640	164
Sunfish..... do.	50	5	50	3
Total.....	758,670	33,719	661,135	23,300

## CRAB INDUSTRY OF MARYLAND AND VIRGINIA.

The blue crab is one of the most valuable fishery resources of Chesapeake Bay. In no other body of water is this species so abundant and important. The increasing magnitude of the fishery has occasioned much concern among those solicitous for its future welfare, and there has been much discussion of the necessity for restrictive measures in Maryland and Virginia. The Bureau desired to give the States full and reliable data on which to base any needed action; and accordingly it placed its agents in the field on November 15, 1915, and on December 21, 1915, was able to issue a printed bulletin containing detailed statistics of the industry for the calendar year 1915. This bulletin, which was very favorably received because of its timely appearance and valuable contents, was distributed to State legislators and fishery officials, to crab fishermen, dealers, and cannerymen, and to all other interested persons.

In Maryland the growth of the hard-crab industry has been quite marked during the past few years, owing to the increasing number of firms engaged in shipping crab meat. The soft-crab fishery has scarcely more than held its own. The crab industry of this State in 1915 gave employment to 7,312 persons, of whom 4,053 were engaged in the shore or boat fisheries, 41 on fishing and transporting vessels, and 3,218 in the wholesale trade and canning industry. The invest-

ment in vessels, boats, fishing apparatus, and shore and accessory property was \$485,627. The wages paid in the wholesale and canning trades amounted to \$191,840. The catch aggregated 90,281,646 crabs in number, or 30,093,882 pounds, valued at \$664,651. This includes 22,491,675 pounds of hard crabs, valued at \$335,375, and 7,602,207 pounds of soft crabs, valued at \$329,276. The hard crabs were taken chiefly with trot lines, and smaller quantities with scrapes and scoop nets. The greater part of the catch of soft crabs was taken with scrapes and scoop nets, and the remainder with trot lines and seines.

Crisfield still remains the center of both soft and hard crab industries, about three-fourths of the entire crab catch of the State being handled and shipped from that place in a live condition or as crab meat. Many soft crabs are also brought here for shipment in the early spring from the western shore of Virginia. In 1915 there were 47 firms in Crisfield and immediate vicinity handling soft crabs only, 17 firms handling hard crabs only, 2 firms handling both soft and hard crabs, and 1 firm which canned soft crabs. Several of the soft-crab firms had branch houses at various localities throughout Somerset and Dorchester Counties, Md., and Accomac County, Va., their products being brought to Crisfield for shipment. Most of the crabs caught on the western shore of Maryland are also brought by gasoline boats to Crisfield for shipment. With the exception of a few shipped by steamer for consumption in Baltimore, practically all of the soft crabs are sent by express from Crisfield.

Somerset County leads all other counties in the production of crabs, the value of its output to the fishermen in 1915 amounting to \$365,498, as compared with \$130,136 for Dorchester, \$106,480 for Talbot, \$18,695 for Queen Anne, \$14,210 for Anne Arundel, \$12,385 for Kent, \$4,900 for Calvert, \$3,425 for St. Mary, \$1,850 for Wicomico, \$1,670 for Charles, and \$1,000 for Baltimore. The value of the hard-crab industry far exceeds that of the soft-crab industry in all of the above counties except Somerset, where the conditions are reversed. All of the soft crabs except a few used for canning at Crisfield are shipped alive, while most of the hard crabs are utilized in the extraction of the meat, which is packed and shipped in tin buckets. There were only 3 firms in the State canning crabs in 1915, 2 of these handling hard and 1 soft crabs; the combined output of these firms was 179,976 cans, including a few glass jars, having a value of \$33,759.

The crab industry of Virginia employed 2,978 persons and \$367,150 in invested capital. The catch amounted to 60,748,158 crabs in number, or 20,249,386 pounds, valued at \$317,156; of these, 18,765,148 pounds, valued at \$242,754, were hard crabs, and the remainder, 1,484,238 pounds, valued at \$74,402, were soft crabs. The most important apparatus used for crabs in Virginia is the trot line, which took 14,042,861 pounds, valued at \$135,817; dredges are next, with a catch of 4,196,000 pounds, valued at \$94,928; the remaining hard crabs were taken by means of scrapes and scoop nets. Scoop nets constitute the most important apparatus used in the soft-crab fishery, the catch with these amounted to 867,797 pounds, valued at \$47,362; scrapes are next in importance with 616,441 pounds, valued at \$27,040.

Considering the relative importance of this industry by counties, Elizabeth City County ranks first with 5,040,840 pounds, valued at \$78,533; Accomac County is next with 4,352,612 pounds, valued at \$96,130. The former county has an excess of 688,228 pounds over the latter, but the value is \$17,597 less. This is explained by the fact that Accomac County has quite an important soft-crab fishery, while Elizabeth City County has only hard crabs. The third in importance is York County, with 2,204,800 pounds, valued at \$27,504; the fourth is Mathews County, with 1,997,760 pounds, valued at \$18,221; the fifth is Norfolk County, with 1,959,000 pounds, valued at \$21,772; the sixth is Northampton County, with 1,050,264 pounds, valued at \$24,587. The remaining counties have less than 1,000,000 pounds each. Accomac County leads in the production of soft crabs, the catch this year being 1,150,996 pounds, valued at \$50,645. Northumberland County leads the western-shore counties in the production of soft crabs, the catch amounting to 166,390 pounds, valued at \$12,564; Lancaster County, the next in point of importance, shows a catch amounting to 78,720 pounds, valued at \$5,928. Great Wicomico River region in the former county, and Corrotoman River, a branch of Rappahannock River, in the latter county, are regarded as quite productive and remunerative soft-crab waters, rendered more remunerative, probably, because of the fact that the soft crabs appear here earlier than on the eastern shore, in the Tangier Sound region, and the Crisfield dealers send boats over in the early spring for the catch.

Crab fishing usually starts in Northumberland and Lancaster Counties about the 15th or 20th of April, while the soft-crab season about Crisfield does not begin until about the middle of May. The catch, as well as the demand, diminishes about the early part of June, and many of the fishermen then seek other employment, although the Crisfield boats continue the trips practically throughout the season. These boats also call at other points on the western shore to make crab collections. Trot-line fishing is carried on with more or less importance in every county along both the eastern and western shores, but at many points on the latter side the fishermen lack good shipping facilities, the only outlet being to Baltimore by steamer, and crabs thus shipped from some places one morning do not reach their destination until the following morning. Many of the York County fishermen go to the lower part of the bay, where they consider the fishing grounds to be more productive, and sell their catch to Hampton. Some little trot-line fishing is carried on by Princess Anne County fishermen living about Lynnhaven Inlet. They start in Lynnhaven River in early spring, before the crabs begin moving about, and get good prices for their early catch, but when the Hampton fishermen begin fishing the price usually drops, and as the Lynnhaven fishermen are handicapped for want of convenient market they have about all abandoned crab fishing by early June. Hampton is, by far, the most important locality in the State for the crab industry, 33 of the 56 vessels hailing from this region. There are 15 wholesale dealers here, 2 of whom handle canned crab meat. These dealers take practically the entire catch of the dredge boats in addition to the trot-line catch of this (Elizabeth City) and other counties.

Crabs are canned only during the summer months, and the crabs used for this purpose are consequently taken by trot lines. The line fishing begins as soon as the water becomes warm enough to cause the crabs to move from the mud in which they have been bedded for the winter for protection from the cold, usually some time in April or early May, and continues through the summer until the cold forces the crabs to again seek the mud bottom. In some sections, however, the line fishing slackens during the extremely hot summer months, this being especially true of those places where the shipping facilities are not favorable. The dredging season usually opens some time during November, usually about the middle of the month, as soon as the crabs have bedded, and extends throughout the winter until the water warms sufficiently to start the crabs from their winter beds. Dredging is mostly done in the lower part of the bay, and sometimes outside the capes when the sea is not too rough. The entire winter catch is picked and sold as fresh meat. Crab meat weighs 5 pounds to the gallon, and an average of 7 crabs will yield 1 pound of meat.

A table showing the details of the industry in Maryland and Virginia follows. There are given also comparative statistics of the catch for a number of years, beginning with 1880. The output in 1915 was the largest for any year for which data are available, and the value then was 50 per cent more than in 1908, the last previous year for which the Bureau had collected complete returns. The information at hand, however, points to a catch in 1915 much short of that a few years before, and the climax of the fishery seems to have been reached about 1912.

## CRAB INDUSTRY OF MARYLAND AND VIRGINIA, 1915.

Items.	Maryland.		Virginia.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.
<b>Persons engaged:</b>						
On vessels fishing.....	33		189		222	
On vessels transporting.....	8				8	
In shore or boat fisheries.....	4,053		1,922		5,975	
Shoresmen.....	3,218		867		4,085	
<b>Total.....</b>	<b>7,312</b>		<b>2,978</b>		<b>10,290</b>	
<b>Vessels, boats, apparatus, and other property:</b>						
Vessels fishing.....	16	\$5,450	56	\$139,100	72	\$144,550
Net tonnage.....	94		497		591	
Vessels transporting.....	4	4,200			4	4,200
Net tonnage.....	26				26	
Gasoline boats.....	1,304	181,475	283	61,160	1,587	242,635
Sail and row boats.....	3,053	119,245	1,693	28,774	4,746	148,019
Apparatus vessel fisheries:						
Dredges.....			182	4,511	182	4,511
Scrapes.....	71	183	18	54	99	237
Apparatus shore fisheries:						
Dredges.....			30	720	30	720
Scrapes.....	2,484	7,452	250	710	2,734	8,162
Scoop nets.....	1,770	874	641	317	2,411	1,191
Trot lines.....	1,525	8,741	1,139	7,449	2,664	16,190
Seines.....	29	111			29	111
Shore and accessory property.....		157,896		124,355		282,251
<b>Total.....</b>		<b>485,627</b>		<b>367,150</b>		<b>852,777</b>
<b>Products:</b>						
Vessel fisheries—						
With dredges—Hard crabs, pounds.....			3,596,400	81,246	3,596,400	81,246
With scrapes—						
Hard crabs..... pounds.....	26,962	577	11,804	265	38,766	842
Soft crabs..... do.....	85,772	3,875	52,332	2,355	138,104	6,230
<b>Total.....</b>	<b>112,734</b>	<b>4,452</b>	<b>3,660,536</b>	<b>83,866</b>	<b>3,773,270</b>	<b>88,318</b>

## CRAB INDUSTRY OF MARYLAND AND VIRGINIA, 1915—Continued.

Items.	Maryland.		Virginia.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.
Products—Continued.						
Shore fisheries—						
With dredges—Hard crabs, pounds.....			599,600	\$13,682	599,600	\$13,682
With scrapes—						
Hard crabs.....pounds..	1,444,435	\$25,190	219,086	5,063	1,663,521	30,253
Soft crabs.....do.....	3,601,394	152,626	564,109	24,685	4,165,503	177,311
With scoop nets—						
Hard crabs.....do.....	1,100,422	20,908	295,397	6,681	1,395,819	27,589
Soft crabs.....do.....	3,530,898	157,024	867,797	47,362	4,398,695	204,386
With trot lines—						
Hard crabs.....do.....	19,919,856	288,700	14,042,861	135,817	33,962,717	424,517
Soft crabs.....do.....	364,877	14,266			364,877	14,266
With seines—Soft crabs...do.....	19,266	1,485			19,266	1,485
Total.....	29,981,148	660,199	16,588,850	233,290	46,569,998	893,489
Grand total.....	c30,093,882	664,651	b20,249,386	317,156	c50,343,268	981,807
Wholesale and canning trade:						
Wages.....		191,840		67,012		258,852
Barrels, boxes, cans, and packing materials used.....		104,529		38,553		143,082
Crabs canned.....cans.....					478,104	91,465

a 90,281,646 in number.

b 60,748,158 in number.

c 151,029,804 in number.

## COMPARATIVE STATISTICS OF THE CRAB PRODUCT OF MARYLAND AND VIRGINIA FOR VARIOUS YEARS FROM 1880 TO 1915.

Years.	Maryland.					
	Crabs, hard.		Crabs, soft.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1880.....	1,166,667	\$46,850	(a)	(a)	1,166,667	\$46,850
1887.....	2,757,638	36,969	1,636,530	\$133,788	4,394,168	170,757
1888.....	2,674,675	37,438	2,208,829	161,331	4,883,504	198,769
1890.....	2,388,099	31,723	4,056,110	228,690	6,444,209	260,413
1891.....	2,776,898	37,460	4,828,872	266,256	7,605,770	303,716
1897.....	5,333,316	39,949	4,115,879	177,637	9,449,195	217,586
1901.....	9,824,793	85,884	4,303,582	202,563	14,128,375	288,447
1904.....	12,665,282	168,996	5,732,865	189,851	18,398,147	358,847
1908 <sup>b</sup> .....	12,786,000	124,000	7,587,000	195,900	20,373,000	319,000
1915.....	22,491,675	335,375	7,602,207	329,276	30,093,882	664,651

Years.	Virginia.						Grand total.	
	Crabs, hard.		Crabs, soft.		Total.			
	<i>Pounds.</i>	<i>Value.</i>	<i>Pounds.</i>	<i>Value.</i>	<i>Pounds.</i>	<i>Value.</i>	<i>Pounds.</i>	<i>Value.</i>
1880.....	2,139,200	\$32,088	(a)	(a)	2,139,200	\$32,088	3,305,867	\$78,938
1887.....	626,820	15,479	(a)	(a)	626,820	15,479	5,020,988	186,236
1888.....	956,843	24,669	(a)	(a)	956,843	24,669	5,840,347	223,438
1890.....	2,584,794	28,210	440,310	\$26,054	3,025,104	54,264	9,469,313	314,677
1891.....	2,208,071	32,683	585,956	29,379	2,794,027	62,062	10,399,797	365,778
1897.....	5,331,398	28,331	1,068,116	39,914	6,399,514	68,245	15,848,709	285,831
1901.....	6,113,277	52,863	1,288,424	65,972	7,401,701	118,835	21,530,076	407,282
1904.....	10,356,052	179,575	1,910,654	92,909	12,266,706	272,484	30,664,853	631,331
1908 <i>b</i> .....	23,001,000	239,000	2,082,000	87,000	25,083,000	326,000	45,456,000	645,000
1915.....	18,765,148	242,754	1,484,238	74,402	20,249,386	317,156	50,343,268	981,807

a Statistics not available.

b The statistics for 1908 are from data published by the Bureau of the Census.



## SHAD AND ALEWIFE INDUSTRY OF CHESAPEAKE BAY AND TRIBUTARIES.

In view of the large interests dependent on the perpetuation of the supply of shad and alewives, or river herring, in the Chesapeake Basin, the Bureau in 1915 made a complete canvass of the industries connected with these fishes, for the purpose of being in position to substantiate the often expressed opinion that radical action was demanded of the States in order to prevent commercial extermination. The results of the canvass were promptly published in a statistical bulletin, which was at once sent to the governors and legislators of Maryland and Virginia, accompanied by three large charts showing the actual location of each pound net and gill net set for shad in 1915 on certain sections of the western shore of Virginia. The data thus supplied are thought to have influenced the Virginia Legislature, in its closing hours, to pass an act, effective in 1917, which will have the effect of permitting a larger portion of the run of spawning fish to reach their spawning grounds. This act, if its object is realized, will supplement in an effective way the protection that has heretofore been afforded to the migrating fish by the War Department through the insistence that certain lanes for navigational purposes shall be left in the maze of set nets on the shores of Chesapeake Bay and its major tributaries.

The fishery for alewives is closely connected with that for shad, the same apparatus being used and the seasons being coincident. The canvass therefore included the alewives as well as the shad, and the published bulletin, herein reprinted, gives the statistics of both fisheries.

The catch of shad in Maryland in 1915, compared with that of 1909, the latest previous year for which statistics are available, declined more than 50 per cent in quantity and about 29 per cent in value, and the catch of alewives decreased nearly 47 per cent in quantity and about 15 per cent in value. Chesapeake Bay, in Maryland, showed a decline of about 45 per cent in the shad catch and 31 per cent in the alewife catch. A still larger decrease occurred in some of the more important rivers. In the Susquehanna River, in Maryland and Pennsylvania, there was a decrease of 88 per cent in the shad and 88 per cent in the alewife catch. In the Choptank River and tributaries there was a decrease of 83 per cent in the catch of shad and 84 per cent in that of alewives. In the Potomac River the shad catch decreased 11 per cent and the alewife catch 74 per cent. In the Northeast River, which was the only one of importance which did not show a decided decline in these species, the catch of shad fell off less than 10 per cent and that of alewives increased 47 per cent.

The catch of shad in the Patuxent River in 1915 amounted to 1,118 in number, compared with 7,485 in 1909, 9,577 in 1904, 43,000 in 1901, and 52,354 in 1896, the only years for which statistics are available. The alewife catch fell off from 796,300 in 1909 to 20,400 in 1915.

The Elk River has never been a prolific shad stream, but has always furnished large quantities of alewives. The largest output of shad was in 1904, when 8,850 were taken. The catch of alewives in this river was 6,736,000 in 1909 and 3,608,950 in 1915.

The decreased run of shad and alewives in the Chesapeake Bay basin of Maryland, Delaware, and Pennsylvania in 1915 resulted in a noticeable decline in the amount of all forms of apparatus used for their capture.

In Virginia the catch of shad in 1915, compared with 1909, decreased 1,316,066 pounds, or 21.82 per cent in quantity, but increased \$169,674, or 34.74 per cent, in value, and the catch of alewives decreased 11,733,850 pounds, or 42.22 per cent in quantity, and increased \$37,575, or 29.26 per cent, in value.

The pound nets fished in Virginia in these waters during the season of 1915, compared with 1909, show a decrease of 31, but the number of gill nets increased from 7,121 in 1909 to 16,793 in 1915. The total catch of shad in Virginia during the year was 1,629,872 in number, or 4,714,134 pounds, valued at \$658,010, and that of alewives was 40,135,328 in number, or 16,054,130 pounds, valued at \$165,950.

In the Potomac River there were but two seines fished during the season of 1915 for herring and shad—one on the Maryland side at Chapmans Point and the other on the Virginia side at Stony Point. There are very few pound nets along the Maryland side of this river, but quite a number of large traps on the Virginia side off Northumberland County near the mouth. The alewife fisheries of Westmoreland County were quite extensive up to a few years ago, and it was in this county that the canning of the roe originated. Several large packing houses were located in this county as recently as 1909, but now there is but one, and that very small. There are a number of large packing houses in that part of Northumberland County bordering on the Potomac, or rather in Coan River and Yeocomico River, which are tributary to the Potomac. Both alewives and roe are packed in large quantities at these points. Drift gill nets are not fished for shad below Maryland Point, and from this place they are used in various locations up to Jones Point, a short distance below Alexandria. The gill-net catch of 1915 was reported by fishermen as the lightest they had ever taken, and many of them made little more than expenses. Some fishermen of Northumberland County along the Potomac reported the herring and shad catch for 1915 as very gratifying and thought that it was the best they have had for several seasons.

The total number of pound nets fished in Virginia during the year was 2,012, valued at \$408,675. Of these, 527, or about 26 per cent, valued at \$107,200, were fished by Mathews County fishermen. Elizabeth City County ranks second in the number of pound nets, having 317, valued at \$73,900; Accomac County third, with 273 nets, valued at \$48,150; followed by Northumberland County with 269, valued at \$73,250, and Gloucester County with 204, valued at \$33,100.

The catch for 1915 showed a great many more bucks than for the average year, and many of these were smaller than usual. This seemed to be the case on all parts of the bay.

In the James River stake gill nets are the leading form of apparatus used for shad fishing. The only drifting grounds remaining are located quite a distance up the river, and the catch with drift nets was negligible in the 1915 season. During the summer of 1909, when a canvass of the shad fisheries was made on this river, very few stake nets were found above Ferguson's Wharf, now called Rushmere, located in Isle of Wight County about 12 miles above Newport News.

Such nets are now found at various points up as far as Tar Bay, near Coggins Point, within a short distance of the mouth of Appomattox River. The shad run appeared in 1915 about March 15 to 20, though a few stray fish were seen earlier, and the gill-net fishing was practically over by the third or fourth week in May. Gill nets can not be used after the water is warm enough to start the crabs, as these hang in the nets and interfere too much with the handling of them. The run was much lighter than usual, but the greater part of the gill-net catch was roe fish, and the high price received partly made up for the decrease in the catch.

The apparatus used in the Chickahominy River consists entirely of seines and drift gill nets, and the catch includes shad and other species. Pound nets are not permitted in this river.

In the Rappahannock River stake gill nets having  $2\frac{3}{4}$ -inch mesh are fished during the winter for perch and discontinued when the shad season opens. The shad nets are then used on the same stands, being the same length as the perch nets but of a larger mesh. Herring do not usually figure in the catch of the perch nets, but there was an early run of branch herring in 1915 and some of the nets made fairly good catches. The fishermen received as high as \$20 per thousand for these early herring. Some herring are caught also in the small pound nets in this river, and the average price for these was about \$10 per thousand.

The number of persons engaged in the shad and alewife industries of Chesapeake Bay and tributaries in 1915 was 8,839, of whom 6,612 were fishermen and 2,227 were employed in shore industries. The investment in boats, fishing apparatus, shore and accessory property, and cash capital amounted to \$1,528,824. The products of these fisheries aggregated 2,129,486 shad in number, or 6,225,549 pounds, valued at \$857,771, and 71,571,278 alewives in number, or 28,628,510 pounds, valued at \$297,899, a total value for both species of \$1,155,670. Compared with the returns for 1909, there was a decrease of 258 in the number of pound nets and an increase of 7,968 in the number of gill nets operated. The catch of shad decreased 3,114,219 pounds, but increased \$88,322 in value, and the catch of alewives decreased 22,803,590 pounds and increased \$13,855 in value.

Statistics by States of the shad and alewife industry of Chesapeake Bay and tributaries in 1915, and also comparative statistics for Maryland and Virginia for various years from 1880 to 1915, and by waters for certain years from 1896 to 1915, are given in detail in the following tables.

## SHAD AND ALEWIFE INDUSTRY OF CHESAPEAKE BAY AND TRIBUTARIES, 1915.

Items.	Pennsylvania.			Delaware.			Maryland.			Virginia.			Total.		
	Number.	Pounds.	Value.	Number.	Pounds.	Value.	Number.	Pounds.	Value.	Number.	Pounds.	Value.	Number.	Pounds.	Value.
Persons engaged:															
Fishermen.....	192			70			2,388			3,952			6,612		
Shoemen.....							1,034			1,193			2,227		
Total.....	192			70			3,422			5,155			8,839		
Boats, apparatus, and other property:															
Gasoline boats.....							a 559		\$147,510	659		\$230,080	1,218		\$377,590
Sail and row boats.....							b 555		19,723	1,091		20,355	1,789		41,838
Apparatus—	110		\$1,360	33		\$400									
Pound nets.....							1,062		161,920	2,012		408,675	3,074		570,595
Stake gill nets.....							2,172		6,209	16,267		16,325	18,439		22,534
Drift and anchored gill nets.....							1,703		33,293	526		14,333	2,297		48,538
Seine.....	8		660	2		400	17		7,925	8		3,795	35		12,780
Dip nets.....	150		300				53		230				203		530
Shore and accessory property.....									121,622			125,197			246,819
Cash capital.....									35,000			172,000			207,000
Total.....			2,320			1,712			533,432			991,360			1,528,824
Products:															
With pound nets—															
Shad.....							312,182	908,635	118,395	1,347,482	3,782,574	523,670	1,659,664	4,691,209	642,065
Alewives (herring).....							23,874,350	9,549,740	105,849,393	653,000	15,861,200	160,762,632	527,350	25,410,940	296,611
With stake gill nets—															
Shad.....							21,320	70,075	9,612	158,605	534,508	77,599	179,925	604,583	87,211
Alewives (herring).....										99,900	39,960	1,998	99,900	39,960	1,998
With drift and anchored gill nets—															
Shad.....				7,850	25,000	3,590	130,332	422,539	57,251	118,381	380,922	54,479	256,563	828,461	115,320
Alewives (herring).....							90,000	36,000	475	250,000	100,000	2,500	340,000	136,000	2,975
With seines—															
Shad.....	6,100	18,300	2,650	1,100	3,080	429	10,299	32,289	3,394	5,404	16,130	2,292	22,903	69,799	8,735
Alewives (herring).....				17,000	6,800	170	7,454,600	2,981,840	25,455	132,428	52,970	630	7,604,028	3,041,610	26,315
With dip nets—shad.....	3,000	10,500	1,575				7,431	20,997	2,865				10,431	31,497	4,440
Total shad.....	9,100	28,800	4,225	8,950	28,080	4,019	481,564	1,454,535	191,517	1,629,872	4,714,134	658,010	2,129,486	6,225,549	857,771
Total alewives (herrings).....				17,000	6,800	170	c 31,418,950	12,867,580	133,779	40,135,328	16,054,130	165,930	1,571,278	28,628,510	297,899
Grand total.....			4,225			4,189			323,296			823,960			1,155,670

[illegible]

x Includes one steamer valued at \$2,500.

<sup>b</sup> Includes 3 vessels of 24 net tons, valued at \$2,450, used as house-boats.

c 4,364,950, weighing 1,745,980 pounds, valued at \$33,492, were salted, and 30,000, weighing 12,000 pounds, valued at \$175, were smoked by the fishermen.

# COMPARATIVE STATISTICS OF THE SHAD AND ALEWIFE PRODUCT OF MARYLAND AND VIRGINIA FOR VARIOUS YEARS FROM 1880 TO 1915. a

Years.	Maryland.			Virginia.			Grand total.				
	Shad.		Alewives.	Shad.		Alewives.	Total value.	Shad.	Alewives.		
	Pounds.	Value.		Pounds.	Value.						
880.....	3,774,426	\$40,826	9,263,959	\$38,667	3,171,953	\$134,496	\$210,796	6,946,379	\$275,422	16,129,372	\$215,967
881.....	4,040,820	146,351	11,062,270	89,273	7,155,126	172,272	201,857	11,924,908	319,223	15,463,905	118,585
882.....	4,808,435	176,635	11,511,774	110,291	7,056,473	221,634	362,003	11,924,908	498,289	17,964,779	150,660
883.....	7,127,480	242,909	19,766,994	143,793	8,286,946	321,634	320,571	14,393,693	471,806	30,408,692	235,467
884.....	6,224,873	211,575	17,418,850	131,245	7,498,242	207,894	301,299	12,723,115	418,969	28,432,335	225,150
885.....	5,541,499	166,551	17,697,315	126,050	7,267,315	307,055	370,079	16,712,018	473,603	28,864,922	189,074
886.....	5,794,593	159,365	17,339,459	123,453	7,282,818	304,448	375,289	17,329,017	483,813	30,828,969	194,294
887.....	3,111,181	120,602	13,747,157	91,308	11,529,474	304,448	481,627	17,329,017	473,603	30,828,969	194,294
888.....	2,912,149	159,772	14,434,970	137,982	6,972,212	366,203	530,358	10,332,148	486,805	27,660,604	206,752
889.....	3,937,000	247,000	28,805,000	157,000	7,419,899	439,625	90,733	10,332,148	599,397	29,088,836	228,715
890.....	3,252,688	272,869	23,637,320	155,499	488,336	486,000	171,000	9,252,888	761,205	66,690,000	328,800
891.....	1,454,535	191,517	12,567,580	131,779	4,714,134	658,010	165,950	9,252,888	840,527	28,621,710	297,729

<sup>a</sup> The catch of shad and alewives in these States outside of the Chesapeake Bay region is included for some years, but is practically negligible.

<sup>b</sup> The statistics for 1908 in this table are from data published by the Bureau of the Census.

## COMPARATIVE STATISTICS OF THE APPARATUS USED IN THE SHAD AND ALEWIFE FISHERIES OF MARYLAND AND VIRGINIA FOR VARIOUS YEARS FROM 1891 TO 1915.

Maryland.												Virginia.											
Years.	Pound nets.		Gill nets.		Seines.		Fyke nets.		Dip nets.		Traps.		Pound nets.		Gill nets.		Seines.		Fyke nets.		Traps.		
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	
1891.....	625	\$59,510	10,254	\$90,650	214	\$36,650	335	\$5,223	128	\$625	15	\$600	708	\$133,880	6,287	\$39,464	27	\$18,510	72	\$1,032	22	\$805	
1896.....	901	66,816	6,593	53,996	90	25,816	34	65	65	230	6	2,043	1,156	236,680	10,748	36,947	16	42	19,005	7	18	8	
1909.....	1,289	161,920	5,620	39,502	29	7,925	34	65	53	230	6	2,043	2,012	408,675	16,793	30,658	8	3,795	7	18	8	8	
1915.....	1,062	161,920	3,875	39,502	17	7,925	34	65	53	230	6	2,043	2,012	408,675	16,793	30,658	8	3,795	7	18	8	8	

CATCH OF SHAD AND ALEWIVES IN CHESAPEAKE BAY AND ITS SEVERAL TRIBUTARIES FOR CERTAIN YEARS FROM 1896 TO 1915, BY WATERS.																																			
Waters.												Shad.												Alewives.											
1896				1901				1904				1909				1915				1909				1915											
Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.												
Chesapeake Bay:																																			
Virginia.....																																			
Maryland.....																																			
Total.....																																			
James River and tributaries.																																			
York River and tributaries.																																			
Mobjack Bay.....																																			
Piankatank River.....																																			
Rappahannock River.....																																			
Potomac River:																																			
Virginia.....																																			
Maryland.....																																			
Total.....																																			
Patuxent River.....																																			
West River.....																																			
South River.....																																			
Savannah River.....																																			
Magdalen River.....																																			
Patapsco River.....																																			
Back River.....																																			
Middle River.....																																			

## CATCH OF SHAD AND ALEWIVES IN CHESAPEAKE BAY AND ITS SEVERAL TRIBUTARIES FOR CERTAIN YEARS FROM 1896 TO 1915, BY WATERS.

	850	177	866	180	16	5	70	25	57,000	137
					206	82			442,500	1,327
Gunpowder River.....										
Bush River.....										
Susquehanna River:										
Maryland.....	69,488	8,874	39,275	8,087	65,717	19,379	6,585	2,359	8,741,500	33,735
Pennsylvania.....	70,599	23,412	76,521	19,867	60,045	22,224	9,100	4,225	1,070,000	3,870
Total.....	140,087	32,286	115,796	27,954	125,762	41,603	15,685	6,584	8,766,500	33,810
Northeast River.....										
Elk River.....	60,620	6,332	(b)	(b)	62,375	14,627	56,247	21,917	3,740,000	9,500
Sassafras River.....	5,244	4,000	8,850	1,600	1,053	287	1,426	524	6,736,000	11,251
Chesler River.....	1,290	2,500	8,150	1,592	1,329	91	386	150	3,527,000	10,285
St. Michaels River.....	53,507	4,475	4,215	1,010	5,718	1,711	1,565	574	646,500	1,771
Eastern Bay.....	2,215									
Choptank River and tribu-										
taries.....	338,420	35,810	40,267	8,237	108,956	32,725	17,960	7,016	2,072,000	4,771
Honga River.....		20,918	40,267	8,237						
Fishing Bay.....	9,790	1,174	10,980	1,801	800	240			4,000	20
Blackwater River.....	13,160	1,480	2,088	497	2,800	840			116,000	232
Transquaking River.....	13,694	1,287	5,618	899	9,900	2,970			33,000	83
Nanticoke River:										
Maryland.....	125,181	34,985	31,028	7,308	21,945	6,583	8,740	4,005	105,727	271
Delaware.....	52,467	37,097	22,450	5,321	7,700	2,310	8,950	4,019	30,000	90
Total.....	177,648	72,082	53,478	12,629	29,645	8,893	17,690	8,024	135,727	361
Marshyhope Creek.....										
Wicomico River.....	38,660	3,865	(c)	(c)	14,475	4,242	2,374	1,092	28,000	216
Manokin River.....	68,015	34,348	28,370	5,946						
Pocomoke:										
Virginia.....	29,752	4,304	1,550	380	5,600	1,960			55,000	412
Maryland.....			13,995	3,179	24,130	8,445	9,734	3,977	30,000	75
Total.....	29,752	4,304	15,545	3,559	29,730	10,405	9,734	3,977	85,000	487
Tangier Sound:										
Virginia.....	21,257	2,422			49,776	17,317	42,916	16,743	642,000	1,685
Maryland.....	1,416	163	1,090	153	55,272	17,530	32,065	12,578	418,273	1,032
Total.....	22,673	2,585	1,090	153	105,048	34,847	74,981	29,321	1,060,273	2,717
Pocomoke Sound:										
Virginia.....	8,320	947			15,400	5,390	5,157	1,940	305,000	1,376
Maryland.....	7,119	801	5,360	814	2,500	875	1,965	774	55,000	136
Total.....	15,469	1,748	5,360	814	17,900	6,265	7,122	2,714	360,000	1,512
Grand total.....	4,867,619	490,757	2,952,042	624,152	2,924,018	785,739	2,129,486	857,771	128,618,249	284,039
									71,571,278	297,899

<sup>a</sup> Includes all tributaries of Chesapeake Bay except the James, Potomac, and Pocomoke Rivers.   <sup>b</sup> Included with Chesapeake Bay.   <sup>c</sup> Included with Nanticoke River.

NUMBER OF POUND NETS, THE CATCH OF SHAD AND ALEWIVES, AND THE AVERAGE CATCH OF EACH SPECIES PER NET FOR CERTAIN SECTIONS OF CHESAPEAKE BAY AND POTOMAC RIVER, 1915.

Locality.	Number of pound nets.	Number of shad.	Number of alewives.	Average number of shad to net.	Average number of alewives to net.
From Cape Henry to Tue Point (lower side of York River mouth).....	496	268,374	1,974,490	541	3,980
From York Spit (inclusive) to Stingray Point.....	623	491,196	4,437,345	772	7,122
From Rappahannock Spit (inclusive) to Smith Point.....	276	291,266	21,667,166	1,054	78,504
Potomac River.....	211	147,271	7,336,000	697	34,760

#### COASTAL FISHERIES OF NEW YORK AND NEW JERSEY.

Following a conference with the fishery authorities of the States of New York and New Jersey in January, 1916, regarding the condition of the coastal fisheries of those States and the measures necessary for their conservation, the Bureau undertook, by request, the canvass of those fisheries so that their actual extent might be known. The field work was completed in June and the results of the canvass were communicated to those interested. The figures related to the calendar year 1915 and covered only fishes proper.

In New York the number of persons engaged in the coastal fisheries was 2,504, and the investment in vessels, boats, fishing apparatus, and shore and accessory property was \$1,771,166. The products amounted to 34,047,775 pounds of fish, valued at \$1,121,641. Some of the more important species taken were bluefish, 6,107,113 pounds, valued at \$492,928; butterfish, 1,244,475 pounds, valued at \$51,636; cod, 1,259,160 pounds, valued at \$59,400; eels, 426,330 pounds, valued at \$34,387; flounders, 3,440,053 pounds, valued at \$96,337; mackerel, 342,489 pounds, valued at \$25,620; menhaden, 14,518,812 pounds, valued at \$100,935; scup, 1,026,736 pounds, valued at \$44,447; sea bass, 973,686 pounds, valued at \$44,894; and squeeteague, 1,859,143 pounds, valued at \$98,324.

In New Jersey there were 2,303 persons employed in the coastal fisheries, and the investment amounted to \$1,192,057. The products aggregated 47,856,176 pounds of fish, valued at \$1,348,667. The species taken in largest quantities were bluefish, 2,728,779 pounds, valued at \$177,906; butterfish, 5,462,917 pounds, valued at \$151,677; cod, 679,133 pounds, valued at \$31,896; croaker, 2,084,719 pounds, valued at \$47,366; eels, 377,698 pounds, valued at \$28,257; flounders, 1,531,376 pounds, valued at \$58,443; mackerel, 367,307 pounds, valued at \$26,161; menhaden, 4,354,789 pounds, valued at \$36,602; scup, 3,279,693 pounds, valued at \$94,776; sea bass, 6,171,922 pounds, valued at \$203,163; squeteague, 14,121,330 pounds, valued at \$358,977; and whiting, 2,407,217 pounds, valued at \$36,367.

The statistics of these fisheries, by counties, are given in detail in the following table:



STATISTICS OF COASTAL FISHERIES OF NEW YORK AND NEW JERSEY, BY COUNTIES,  
EXCLUSIVE OF SHELLFISH, 1915.

## NEW YORK.

Items.	Kings, New York, Queens, and Rich- mond Counties.		Nassau County.		Suffolk County.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Persons engaged...	841		119		1,544		2,504	
Vessels fishing...	57	\$306,395	4	\$5,850	84	\$763,896	145	\$1,076,141
Tonnage...	2,576		32		2,371		4,979	
Outfit...		145,225		620		49,256		195,101
Vessels trans- porting...					21	52,720	21	52,720
Tonnage...					266		266	
Outfit...						2,240		2,240
Sail, row, and house boats...	11	225	39	890	474	16,160	524	17,275
Gasoline boats...	4	2,850	34	14,750	282	112,025	320	129,625
Pound nets...		2,800			460	114,215	464	117,015
Seines...	20	17,900	23	1,173	117	37,010	160	56,083
Gill nets...	100	1,100	84	3,375	469	11,670	653	16,145
Fyke nets...					5,373	24,152	5,373	24,152
Lines...		4,500		635		1,838		6,973
Ottertrawls...					156	3,815	156	3,815
Eelpots...	250	275	390	430	5,055	5,503	5,695	6,208
Other apparatus...				2,276		112		2,388
Shore and access- ory property...		650		1,050		63,585		65,285
Total.....		481,920		31,049		1,258,197		1,771,166
Products:								
Albacore and horse mackerel...	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Alewives...	430	\$25			4,450	\$129	4,880	\$154
Bluefish...	11,000	140	500	\$10	523,605	7,214	535,105	7,364
Bonito...	5,790,205	466,522	27,200	2,690	289,708	23,716	6,107,113	492,928
Butterfish...	1,054	100	300	30	11,795	13,149	13,149	1,287
Carp...	60,000	1,800			1,184,475	49,836	1,244,475	51,636
Cod...					102,300	7,592	102,300	7,592
Croaker...	723,375	32,855	201,000	9,550	334,785	16,995	1,259,160	59,400
Eel...	14,919	336			10,000	350	24,949	686
Flounders...	5,630	532	32,900	3,395	387,800	30,460	426,330	34,387
Haddock...	28,123	838	115,000	3,240	3,296,930	92,259	3,440,053	96,337
Hake...	34,041	1,238	2,000	100	49,550	2,573	85,591	3,911
Hog choker...	2,044	63	8,500	200	52,725	1,238	63,269	1,501
Kingfish...	89	18			7,200	60	7,200	60
Mackerel...	9,360	968	6,800	630	31,005	3,170	31,094	3,183
Menhaden...	2,632,100	19,307	6,000	60	326,329	24,022	342,489	25,620
Mullet, fresh...					11,880,712	81,568	14,518,812	100,935
Mummichog...			8,000	40	5,113	203	5,113	203
Pike...					138,250	1,023	146,250	1,063
Pollock...	16,170	529	30,000	900	800	96	800	96
Scup, or porgy...	511,476	20,574			35,540	1,465	81,710	2,894
Sea bass...	270,263	14,398	150,000	2,500	515,260	23,873	1,026,736	44,447
Sea robins...	2,657	29			553,423	27,996	973,686	44,894
Shad...	5,250	785			97,905	1,251	100,562	1,280
Sharks...	20,975	84			14,705	1,365	19,955	2,150
Skates...	7,700	77			19,225	192	40,200	2,276
Smelt...			2,300	350	204,463	1,360	212,163	1,437
Spanish mack- erel...	529	162	50	10	4,450	1,320	6,750	1,770
Spot...					20	2	599	174
Squeteague...	592,254	22,477	56,950	3,022	1,500	60	1,500	60
Squid...	1,200	12			1,209,939	72,825	1,859,143	98,324
Striped bass...			2,200	344	556,425	8,306	557,625	8,318
Sturgeon...					14,700	2,460	16,900	2,804
Surgeon caviar...					3,826	673	3,826	673
Swallowtail...					241	248	241	248
Swordfish...					50,225	370	50,225	370
Tautog...	881	38	100	5	7,362	756	7,362	756
Tilefish...	a 183,484	7,748			98,100	3,989	99,081	4,032
Tomcod...					70,157	2,716	183,484	7,748
White bait...					28,200	2,220	70,157	2,716
White perch...					19,400	2,038	28,200	2,220
Whiting...	1,000	10			328,925	3,742	19,400	2,038
Other fish...					213	12	329,925	3,752
Total.....	10,926,239	591,665	649,800	27,076	22,471,736	502,900	34,047,775	1,121,641

a Landed by New York vessels and does not include tilefish landed at New York by vessels from other ports.

STATISTICS OF COASTAL FISHERIES OF NEW YORK AND NEW JERSEY, BY COUNTIES,  
EXCLUSIVE OF SHELLFISH, 1915—Continued.

## NEW JERSEY.

Items.	Atlantic County.		Bergen and Hudson Counties. <sup>a</sup>		Cape May County.		Middlesex County.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
Persons engaged.....	298		43		680		54	
Vessels fishing.....	19	\$71,485			25	\$74,690		
Tonnage.....	349				330			
Outfit.....		25,130				32,725		
Vessels transporting.....	2	3,500			1	50		
Tonnage.....	15				10			
Outfit.....		45						
Sail, row, and house boats.....	63	1,720	16	\$742	38	480	21	\$900
Gasoline boats.....	34	12,250	4	900	130	69,600	8	2,400
Pound nets.....	3	1,950			58	128,325	1	600
Seine.....	42	1,722	5	215	21	3,988	10	4,175
Gill nets.....	45	1,785	10	1,315	192	15,912		
Fyke nets.....	11	460	26	400	48	2,050	4	200
Bag nets.....	15	375						
Lines.....		624		10		3,186		
Eel pots.....	50	45	4	6	202	325	98	98
Other apparatus.....				75				
Shore and accessory property.....		2,420		1,436		38,840		550
Total.....		123,511		5,099		370,171		8,923
Products:								
Albacore and horse mackerel.....	800	\$11			10,220	\$172		
Alewives.....	13,862	329	300	\$30	24,500	474	7,500	\$100
Bluefish.....	163,664	12,004			874,335	55,620	18,900	915
Bonito.....	800	48			17,469	857		
Butterfish.....	49,205	1,041			2,166,453	61,712		
Carp.....			10,650	1,157			12,500	1,100
Cod.....	201,000	9,330			261,870	12,842		
Croaker.....	297,278	6,488			1,063,735	24,515		
Drum.....	480	5			5,550	63		
Eel.....	5,875	419	8,025	670	42,885	4,669	1,800	127
Flounders.....	68,744	2,728			318,044	11,748	4,400	197
Haddock.....					200	10		
Hake.....	200	3			1,249	37		
Kingfish.....	24,068	2,150			17,429	1,925		
Mackerel.....	152,125	10,860			148,232	10,509		
Menhaden.....	1,200,000	14,000			101,381	598	112,569	236
Mullet, fresh.....	5,500	103			34,750	996		
Mullet, salted.....					500	50		
Pollock.....					325	4		
Scup, or porgy.....	840,400	25,109			1,887,117	53,090		
Sea bass.....	1,522,238	49,280			3,943,624	123,796		
Shad.....	115	19	20,104	2,674	170	20	1,705	312
Sharks.....					10,198	143		
Skates.....	1,200	11			89,180	911		
Smelt.....							6,000	1,200
Spanish mackerel.....					270	39		
Spot.....	4,175	132			13,085	304	2,000	60
Squeteague.....	1,634,099	42,613			4,331,759	122,331	88,200	3,013
Squid.....	500	6			289,826	3,617		
Striped bass.....	7,080	1,384					200	25
Sturgeon.....					65	4		
Suckers.....	3,550	226	15,000	1,645				
Tautog.....	600	12			760	19		
White perch.....	27,159	2,373			1,575	145	75	6
Whiting.....					2,000	33		
Yellow perch.....	165	15			450	22		
Other fish.....	1,200	83	5,035	495	180	19		
Total.....	6,226,082	180,782	59,114	6,671	15,664,386	491,288	255,849	7,291

<sup>a</sup> Includes men, boats, apparatus, and shore property employed and catch of fish taken in Upper New York Bay and Hackensack River, and also men, boats, apparatus, and shore property employed and catch of shad taken in Hudson River.

STATISTICS OF COASTAL FISHERIES OF NEW YORK AND NEW JERSEY, BY COUNTIES,  
EXCLUSIVE OF SHELLFISH, 1915—Continued.

## NEW JERSEY—Continued

Items.	Monmouth County.		Ocean and Burling- ton Counties.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.
Persons engaged.....	582		646		2,303	
Vessels fishing.....	3	\$7,300	1	\$1,500	48	\$154,975
Tonnage.....	38		6		723	
Outfit.....		3,900		80		61,835
Vessels transporting.....	2	11,000			5	14,550
Tonnage.....	21				46	
Outfit.....		1,450				1,495
Sail, row, and house boats.....	67	1,655	206	10,436	411	15,933
Gasoline boats.....	179	78,150	154	55,100	509	218,400
Pound nets.....	65	83,090	47	127,800	174	341,765
Seines.....	8	2,440	46	2,410	132	14,950
Gill nets.....	155	8,050	1,359	10,626	1,761	37,688
Fyke nets.....	103	1,430	778	5,660	970	10,200
Bag nets.....			75	1,900	90	2,275
Lines.....		2,327		725		6,872
Otter trawls.....			1	20	1	20
Eelpots.....	1,424	1,822	3,461	2,685	5,239	4,981
Other apparatus.....		7		30		112
Shore and accessory property.....		118,725		144,035		306,006
Total.....		321,346		363,007		1,192,057
Products:	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Albacore and horse mackerel.....	14,255	\$654	44,987	\$1,095	70,262	\$1,932
Alewives.....	214,270	2,153	351,865	3,779	617,297	6,865
Bluefish.....	1,402,898	87,697	268,982	21,670	2,728,779	177,906
Bonito.....	23,175	1,908	75,878	6,291	117,322	9,104
Butterfish.....	711,881	22,297	2,535,378	66,627	5,402,917	151,677
Carp.....					23,150	2,257
Cod.....	122,908	5,697	93,355	4,027	679,133	31,896
Croaker.....	288,080	7,178	435,626	9,185	2,084,719	47,366
Drum.....	8,600	86			14,630	154
Eel.....	131,238	9,161	187,875	13,211	377,698	28,257
Flounders.....	373,415	15,297	766,773	28,473	1,531,376	58,443
Goosefish.....	40,000	125			40,000	125
Haddock.....					200	10
Hake.....	727,493	9,305	439,683	4,638	1,168,625	13,983
Hickory shad.....	3,500	165			3,500	165
Kingfish.....	5,910	904	13,190	2,188	60,597	7,167
Mackerel.....	50,175	3,490	16,775	1,302	367,307	26,161
Menhaden.....	2,765,830	20,142	175,009	1,626	4,354,789	36,602
Mullet, fresh.....	22,750	910			63,000	2,003
Mullet, salted.....					500	50
Pollock.....	3,500	111	8,999	267	12,824	382
Round herring.....	35,432	717			35,432	717
Scup, or porgy.....	164,950	5,992	387,226	10,585	3,279,693	94,776
Sea bass.....	327,800	16,339	378,260	13,748	6,171,922	203,163
Sea robins.....	35,500	425	41,375	620	76,875	1,045
Shad.....	12,813	2,183	7,230	1,060	42,137	6,268
Sharks.....	84,550	748	17,800	175	112,548	1,066
Skates.....	272,470	1,600	150,716	857	513,566	3,379
Smelt.....					6,000	1,200
Spanish mackerel.....	164	34	621	109	1,055	182
Spot.....	18,950	431	28,450	740	66,660	1,667
Squeteague.....	3,055,048	86,973	5,012,224	104,047	14,121,330	358,977
Squid.....	157,370	2,125	523,975	7,082	973,671	12,830
Striped bass.....	220	44	7,148	1,770	14,648	3,223
Sturgeon.....	2,788	435	500	50	3,353	489
Sturgeon caviar.....	270	272			270	272
Suckers.....			8,700	586	27,250	2,457
Tautog.....	40,650	1,772	3,000	105	45,010	1,908
Tilefish.....	30	3			30	3
Toadfish.....	5,800	80			5,800	80
White bait.....	750	33			750	33
White perch.....			136,130	12,881	164,939	15,405
Whiting.....	1,754,995	26,636	650,222	9,698	2,407,217	36,367
Yellow perch.....					615	87
Other fish.....			365	21	6,780	618
Total.....	12,880,428	334,122	12,770,317	328,513	47,856,176	1,348,667

## SHAD FISHERY OF THE HUDSON RIVER.

In connection with the canvass of the coastal fisheries of New York and New Jersey the shad fishery of the Hudson River was covered for the years 1915 and 1916. The statistics are given in the following table, showing for the latter year 119 fishermen, 79 gill nets, 3 seines, and a catch of 9,287 shad, valued at \$5,465. The Hudson was at one time one of the great shad streams, its annual output running into the hundreds of thousands. Thus, in 1896 the number of shad taken was 588,898, valued at \$83,237. The present condition of the shad fishery is most deplorable.

SHAD FISHERY OF THE HUDSON RIVER, 1915 AND 1916.<sup>a</sup>

1915.

Items.	New York.			New Jersey.			Total.		
	No.	Lbs.	Value.	No.	Lbs.	Value.	No.	Lbs.	Value.
Fishermen.....	133			27			160		
Sail and row boats.....	81		\$2,975	7		\$430	88		\$3,405
Gasoline boats.....	2		225	2		600	4		825
Gill nets.....	79		3,984	7		1,035	86		5,019
Seines.....	2		190				2		190
Shore and accessory property.....			528			1,230			1,758
Total.....			7,902			3,295			11,197
Shad caught:									
With gill nets.....	11,333	47,333	5,834	4,249	20,104	2,674	15,582	67,437	8,508
With seines.....	62	298	33				62	298	33
With other apparatus incidentally.....	211	933	102				211	933	102
Total.....	11,606	48,564	5,969	4,249	20,104	2,674	15,855	68,668	8,643

1916.

Fishermen.....	108			11			119		
Sail and row boats.....	64		\$2,240	3		\$195	67		\$2,435
Gasoline boats.....	2		225	1		350	3		575
Gill nets.....	76		2,937	3		480	79		3,417
Seines.....	3		350				3		350
Shore and accessory property.....			528			540			1,068
Total.....			6,280			1,565			7,845
Shad caught:									
With gill nets.....	7,536	31,670	4,399	1,500	7,250	925	9,036	38,920	5,324
With seines.....	191	1,008	99				191	1,008	99
With other apparatus incidentally.....	60	245	42				60	245	42
Total.....	7,787	32,923	4,540	1,500	7,250	925	9,287	40,173	5,465

<sup>a</sup> Includes Albany, Columbia, Dutchess, Green, Orange, Remselaer, Rockland, Schuylcr, Ulster, and Westchester Counties in New York, and Bergen and Hudson Counties in New Jersey.

## NEW ENGLAND VESSEL FISHERIES.

Statistics of the extensive offshore vessel fisheries centering at Boston and Gloucester, Mass., have been collected during the year by the local agents, and published in monthly and annual bulletins showing, by species and fishing grounds, the quantities and values of the fishery products landed by the American fishing vessels at these ports.

The fleet in 1915 was composed of 410 sail, steam, and gasoline screw vessels. These vessels landed at Boston 3,772 trips, aggregating

97,899,487 pounds of fish, valued at \$2,911,314; and at Gloucester 3,472 trips, aggregating 73,696,241 pounds, valued at \$1,826,603. The total for the two ports was 7,244 trips, aggregating 171,595,728 pounds of fresh and salted fish, having a value to the fishermen of \$4,737,917. Compared with the previous year there was a decrease of 354 trips, but an increased production amounting to 9,006,508 pounds in quantity and \$342,887 in value. There was a small decrease in the catch of cod, but an increase in that of practically all the other important species. The value of haddock and cusk was slightly less than that of the previous year. The halibut product increased 491,100 pounds in quantity and \$46,946 in value. The mackerel catch increased 6,688,850 pounds, or over 63 per cent, in quantity, and \$259,354, or 73 per cent, in value. There was some decrease in the take of Newfoundland herring, but an increase in the value. Swordfish increased 739,123 pounds in quantity and \$43,890 in value.

The following tables present in detail (1) by fishing grounds and (2) by months the products of the vessel fisheries of Boston and Gloucester during the calendar year 1915. The weights of fresh and salted fish given in these statistics represent the fish as landed from the vessels, and the values are those received by the fishermen. The grades, or sizes, given for certain species are those recognized in the trade.





QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS  
DURING THE CALENDAR YEAR 1915, SHOWN BY FISHING GROUNDS—Continued.

	Haddock.				Hake.			
	Large (over 2½ pounds).		Scrod (1 to 2½ pounds).		Large (6 pounds and over).		Small (under 6 pounds).	
	Fresh.	Salted.	Fresh.	Fresh.	Fresh.	Salted.	Fresh.	Fresh.
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
<b>LANDED AT BOSTON.</b>								
<i>East of 66° west longitude.</i>								
La Have Bank.....	378,625	\$12,403	31,242	\$523	33,250	\$911	67,710	\$938
Western Bank.....	2,160,230	38,661	179,995	1,815	10,000	200	7,045	133
Grand Bank.....							225	3
St. Peters Bank.....					2,800	70		
Cape North.....					3,800	49		
Cape Shore.....	1,037,452	45,100	92,330	1,129	94,955	3,640	118,975	2,426
Gulf of St. Lawrence.....	76,360	2,512	3,560	38	1,300	52	1,500	25
St. Ann's Bank.....	25,900	616	100	2	2,885	87	1,580	27
The Gully.....					4,900	245	2,400	96
Roseway Bank.....	2,675	47						
<i>West of 66° west longitude.</i>								
Browns Bank.....	7,438,830	201,325	717,381	9,930	265,403	11,126	358,607	8,701
Georges Bank.....	3,974,542	103,064	1,869,868	36,671	58,612	1,098	41,000	686
Cashes Bank.....	38,200	957	2,960	36	162,102	4,754	289,979	4,393
Clark Bank.....	166,495	3,376	36,075	200	300	6	3,550	50
Firpenies Bank.....	12,040	309	2,675	30	30,065	1,058	42,910	841
Tillies Bank.....	2,300	58	1,060	11			4,000	48
Middle Bank.....	849,883	36,111	302,696	6,425	174,522	6,842	553,474	11,384
Jeffreys Ledge.....	1,587,032	73,835	552,373	12,707	304,100	12,084	1,350,172	27,153
Ipswich Bay.....	9,327	341	665	6	3,105	76	8,560	128
South Channel.....	11,464,217	311,271	6,225,145	76,898	564,687	15,709	1,461,593	22,504
Nantucket Shoals.....	83,175	2,178	21,220	172	18,950	735	26,735	497
Off Highland Light.....	37,585	1,717	9,115	203	7,640	257	18,030	295
Off Chatham.....	5,618,771	161,469	1,634,349	16,594	256,365	7,404	750,515	12,215
Bay of Fundy.....	17,175	569	3,290	39	70,360	1,996	123,645	1,469
Seal Island.....	6,670	181	800	8	5,360	1,107	1,980	23
Shore, general.....	447,312	18,123	117,470	2,697	767,145	24,929	1,555,752	25,899
Total.....	36,035,096	1,014,223	11,804,369	166,064	2,842,606	93,190	6,820,297	119,954



LANDED AT GLOUCESTER.

*East of 66° west longitude.*

La Have Bank.....	230,660	2,408	11,035	\$193	.....	964,811	11,530	28,680	453
Western Bank.....	987,020	10,189	9,085	183	184	110,230	14,164	45,708	800
Quebec Bank.....	108,810	1,091	2,960	52	27,120	1,297	1,297	23,633	398
Green Bank.....	.....	.....	.....	.....	.....	14,615	183	3,385	60
Grand Bank.....	.....	.....	14,075	246	.....	33,975	415	81,640	1,282
St. Peters Bank.....	.....	.....	.....	.....	.....	435	5	5,200	91
Sambro Bank.....	6,780	71	.....	.....	.....	171,880	2,149	.....	.....
Burgoyne Bank.....	.....	.....	.....	.....	.....	1,675	17	.....	.....
Bacalleu Bank.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Off Newfoundland.....	100	1	.....	.....	.....	.....	.....	975	17
Cape North.....	.....	.....	50	1	.....	1,135	11	.....	.....
Cape Shore.....	115,250	2,780	5,584	98	520	341,890	4,226	13,585	238
Gulf of St. Lawrence.....	8,785	791	17,490	3	1,115	84,905	29,270	29,270	512
St. Ann's Bank.....	12,760	140	30	1	20	937	134	28,266	474
The Gully.....	5,230	53	.....	.....	.....	10,730	133	3,375	59
.....	.....	.....	.....	.....	.....	78,240	1,213	7,105	120

*West of 66° west longitude.*

Browns Bank.....	1,410,412	17,601	5,215	91	12,540	122	506,533	5,849	11,915	207	
Georges Bank.....	4,833,132	50,480	61,926	1,100	777,965	5,693	69,442	838	2,646	43	
Cashes Bank.....	12,070	126					244,600	2,467			
Fippenes Bank.....							13,675	137			
Jeffreys Ledge.....	1,075	11					78,435	784			
Ipswich Bay.....	1,725	17					5,885	59			
South Channel.....	400,245	4,128			235,625	1,639	29,690	367			
Nantucket Shoals.....	740	8	2,300	40							
Bay of Fundy.....							46,900	469			
Shore, general.....	776,216	28,242	234	4	5,690	67	951,171	17,075	10,152	178	
Total.....	8,913,010	117,437	130,594	2,361	1,060,575	7,728	4,926,412	64,326	295,625	4,932	
Grand total.....	44,948,106	1,131,660	130,594	2,361	12,864,944	173,792	7,769,018	157,516	300,625	5,007	119,934

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS  
DURING THE CALENDAR YEAR 1915, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Pollock.		Cusk.		Halibut.	
	Fresh.		Fresh.		Fresh.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
LANDED AT BOSTON.						
<i>East of 66° west longitude.</i>						
La Have Bank.....	17,428	\$277	76,088	\$1,132	16,647	\$1,998
Western Bank.....	18,680	419	1,995	29	22,504	2,354
Quebec Bank.....					8,338	577
Green Bank.....					50,000	3,500
Grand Bank.....	555				60,000	3,760
St. Peters Bank.....		11			30,000	2,400
Off Newfoundland.....					55,000	4,400
Cape North.....	51,987	1,204	155,595	2,222	35,000	3,150
Cape Shore.....					28,743	3,823
Gulf of St. Lawrence.....					160,000	10,400
St. Ann's Bank.....		3	200	3	47	3
The Gully.....	185				231	19
Roseway Bank.....						
<i>West of 66° west longitude.</i>						
Browns Bank.....	334,799	7,051	1,371,140	20,386	191,392	28,372
Georges Bank.....	487,521	10,775	1,017,058	1,011	124,512	16,700
Cashes Bank.....	22,490	550	100,171	3,079	2,061	261
Clark Bank.....	5,355	104	10,135	130	2,406	354
Fippenes Bank.....	6,345	161	49,985	854	420	70
Tilles Bank.....	1,350	44	600	4		
Middle Bank.....	253,387	6,441	180,963	3,345	8,687	1,225
Jeffreys Ledge.....	998,251	29,054	479,261	8,541	7,771	1,348
Ipswich Bay.....	17,700	415	9,100	163	31	31
South Channel.....	498,737	12,101	148,307	2,236	86,968	12,504
Nantucket Shoals.....	42,275	825	12,195	215	4,173	448
Off Highland Light.....	2,645	66	3,100	53	1,176	114
Off Chatham.....	1,224,002	26,972	83,362	1,609	26,394	3,551
Bay of Fundy.....	3,470	44	49,965	686	120	25
Seal Island.....	955	12	14,720	155	584	57
Shore, general.....	299,340	7,204	413,741	7,212	7,242	910
Total.....	4,284,447	103,733	3,321,681	53,127	930,409	102,327

## LANDED AT GLOUCESTER.

*East of 66° west longitude.*

La Have Bank.....	28,530	267	5,795	\$102	539,944	7,563	5,295	\$133	80,412	6,544	2,525	.....	.....
Western Bank.....	58,525	536	3,632	64	462,095	6,764	14,125	353	244,487	19,626	20,609	.....	\$152
Quereau Bank.....	4,461	45	8,193	144	38,449	569	12,050	300	540,334	40,804	20,114	.....	1,405
Green Bank.....	.....	.....	90	2	390	6	1,940	26	83,115	5,970	41,035	.....	10
Grand Bank.....	.....	.....	7,775	136	1,820	28	3,680	91	672,373	52,750	41,035	.....	2,462
St. Peters Bank.....	110	1	.....	.....	270	4	30	1	6,200	588	20	.....	2
Sambro Bank.....	3,455	35	.....	.....	57,605	706	.....	.....	.....	.....	.....	.....	40
Burgeo Bank.....	.....	.....	.....	.....	455	7	137	3	95,092	5,545	400	.....	117
Bacaleu Bank.....	.....	.....	.....	.....	.....	.....	415	10	31,940	1,930	1,945	.....	.....
Off Newfoundland.....	.....	.....	.....	.....	410	7	85	2	65,688	3,201	.....	.....	.....
Cape North.....	.....	.....	280	5	.....	.....	2,010	50	2,500	164	510	.....	31
Cape Shore.....	9,460	89	1,640	29	308,917	4,385	10,925	269	100,424	9,269	.....	.....	.....
Gulf of St. Lawrence.....	1,700	1	26,972	471	15,595	298	330	21	228,504	11,969	116,621	.....	8,575
St. Ann's Bank.....	1,795	13	.....	.....	550	8	.....	.....	.....	.....	.....	.....	.....
The Gully.....	2,835	57	255	4	10,212	151	3,075	76	266,516	22,791	275	.....	21
Labrador Coast.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	102,151	.....	8,673
<i>West of 66° west longitude.</i>													
Browns Bank.....	58,820	593	1,950	31	864,602	13,196	8,200	206	64,784	4,522	.....	.....	.....
Georges Bank.....	151,978	1,500	173,359	2,095	133,170	2,161	31,150	761	171,397	13,817	305	.....	21
Cashes Bank.....	8,320	75	.....	.....	167,008	2,417	.....	.....	.....	.....	.....	.....	.....
Fippenies Bank.....	.....	.....	.....	.....	7,280	116	.....	.....	.....	.....	.....	.....	.....
Jeffreys Ledge.....	870	8	.....	.....	91,250	1,458	.....	.....	.....	.....	.....	.....	.....
Ipswich Bay.....	1,385	13	.....	.....	530	7	.....	.....	.....	.....	.....	.....	.....
South Channel.....	4,880	44	.....	.....	940	15	.....	.....	.....	.....	.....	.....	.....
Nantucket Shoals.....	2,945	26	2,850	50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bay of Fundy.....	360	3	1,846	37	192,568	2,990	1,796	45	.....	.....	.....	.....	.....
Shore, general.....	8,338,067	142,144	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	8,676,866	145,455	234,640	4,070	2,914,120	42,876	94,943	2,347	2,653,766	199,460	286,510	.....	21,509
Grand total.....	12,961,313	249,188	234,640	4,070	6,235,801	96,003	94,943	2,347	3,584,175	301,787	286,510	.....	21,509

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS  
DURING THE CALENDAR YEAR 1915, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Mackerel.									
	Large (over 2½ pounds).			Medium (1½ to 2½ pounds).			Small (under 1½ pounds).			Value.
	Fresh.		Salted.	Fresh.		Salted.	Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	
LANDED AT BOSTON.										
<i>East of 66° west longitude.</i>										
Cape Shore.....	258,790	\$26,316	104,037	\$4,160	269,592	\$20,488	37,763	\$1,781	281,792	\$14,434
Georges Bank.....	125,247	14,750	15,000	1,260	228,690	22,514	1,400	181	166,346	8,408
Middle Bank.....	2,399	503	161	26	5,354	454	833	100	62,568	3,104
Jeffreys Ledge.....	1,439	304			1,000	100			5,112	433
Ispswich Bay.....					1,545	170			8,420	618
South Channel.....	3,140	675			8,147	996			20,490	808
Nantucket Shoals.....	7,050	1,274			17,711	1,929			57,790	3,089
Off Nahant.....	26,531	994	6,000	420	37,811	2,703	36,000	2,460	197,973	10,009
Off Race Point.....	36,007	2,098			30,123	1,703			574,542	28,852
South.....	11,832	1,422	18,000	856	6,864	961	6,000	285	701	112
Shore, general.....	166,433	15,515	2,700	113	244,554	20,697	3,600	180	2,463,370	98,885
Total.....	638,888	63,851	145,898	6,835	851,391	72,715	85,596	4,987	3,839,104	168,782
LANDED AT GLOUCESTER.										
<i>East of 66° west longitude.</i>										
Cape Shore.....			624,700	23,958						
Gulf of St. Lawrence.....			22,800	1,980			23,600	2,210		
Georges Bank.....	5,100	391	221,700	15,596	7,600	650	21,500	1,505	532,921	25,103
Middle Bank.....					126,865	5,365	20,600	1,157	6,730	220
Nantucket Shoals.....							2,000	140	13,600	945
Off Race Point.....									1,256,681	40,733
Shore, general.....	51,025	3,479			14,669	782				
Total.....	56,125	3,870	869,200	41,534	149,134	6,797	67,700	5,012	1,809,932	67,001
Grand total.....	695,013	67,721	1,015,098	48,369	1,000,525	79,512	153,296	9,999	5,649,036	235,783
									2,405,434	172,695

Fishing grounds.	Miscellaneous.				Total.				Grand total.
	Fresh.		Salted.		Fresh.		Salted.		
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	
LANDED AT BOSTON.									
East of 66° west longitude.									
La Have Bank.....	6,796	\$464	944,359	\$27,598	944,359	\$27,598	944,359	\$27,598	Value.
Western Bank.....	82,882	8,991	2,881,105	61,005	2,881,105	61,005	2,881,105	61,005	\$21,096
Quebean Bank.....			23,338	977	23,338	977	23,338	977	61,005
Green Bank.....			50,000	3,500	50,000	3,500	50,000	3,500	977
Grand Bank.....	360	31	69,635	4,454	69,635	4,454	69,635	4,454	3,500
St. Peters Bank.....	508	37	36,608	2,671	36,608	2,671	36,608	2,671	4,454
Off Newfoundland.....	a 600,000	15,900	655,000	20,300	655,000	20,300	655,000	20,300	4,571
Cape North.....			40,100	3,235	40,100	3,235	40,100	3,235	20,300
Cape Shore.....			4,916,815	214,669	4,916,815	214,669	4,916,815	214,669	3,235
Gulf of St. Lawrence.....	871,924	67,023	251,200	13,259	251,200	13,259	251,200	13,259	5,083,858
St. Ann's Bank.....			35,737	874	35,737	874	35,737	874	221,495
The Gully.....			26,785	995	26,785	995	26,785	995	13,259
Roseway Bank.....			3,906	91	3,906	91	3,906	91	26,785
West of 66° west longitude.									
Browns Bank.....	188,492	8,670	14,662,409	394,142	14,662,409	394,142	14,662,409	394,142	3,906
Georges Bank.....	1,475,094	142,324	13,034,502	491,661	13,034,502	491,661	13,034,502	491,661	14
Cashes Bank.....	34,858	1,814	390,940	21,349	390,940	21,349	390,940	21,349	1,411
Clark Bank.....	9,389	235	308,837	6,932	308,837	6,932	308,837	6,932	16,400
Fippinies Bank.....	6,325	118	192,125	4,985	192,125	4,985	192,125	4,985	6,932
Tillies Bank.....	650	21	12,400	285	12,400	285	12,400	285	4,985
Middle Bank.....	80,375	1,797	2,869,571	92,231	2,869,571	92,231	2,869,571	92,231	1,204
Jeffreys Ledge.....	222,079	5,632	6,858,171	201,945	6,858,171	201,945	6,858,171	201,945	143
Ipswich Bay.....	1,698	37	269,644	9,551	269,644	9,551	269,644	9,551	6,393,641
South Channel.....	1,028,835	34,432	24,298,901	587,760	24,298,901	587,760	24,298,901	587,760	6,533
Nantucket Shoals.....	50,361	1,708	1,070,608	33,021	1,070,608	33,021	1,070,608	33,021	20,945
Off Highland Light.....	5,483	99	97,324	3,406	97,324	3,406	97,324	3,406	587,760
Off Chatham.....	465,647	9,310	14,174,593	375,355	14,174,593	375,355	14,236,953	378,895	33,021
Off Race Point.....	11,949	228	652,621	32,911	652,621	32,911	730,721	34,570	3,406
Bay of Fundy.....	9,300	291	299,360	5,574	299,360	5,574	299,360	5,574	3,406
Seal Island.....	750	16	46,269	780	46,269	780	46,269	780	3,956
South.....	28,483	1,101	47,900	3,596	47,900	3,596	47,900	3,596	71,900
Shore, general.....	627,096	13,834	8,161,582	208,782	8,161,582	208,782	8,314,342	270,678	1,141
Total.....	5,809,344	314,113	97,397,285	2,888,354	502,202	22,960	97,899,487	2,911,314	7,896

a Herring.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS  
DURING THE CALENDAR YEAR 1915, SHOWN BY FISHING GROUNDS—Continued.

Fishing grounds.	Miscellaneous.				Total.		Grand total.	
	Fresh.		Salted.		Fresh.	Salted.		
	Pounds.	Value.	Pounds.	Value.				
LANDED AT GLOUCESTER.								
East of 66° west longitude.								
La Have Bank.....					Pounds.	Value.	Pounds.	Value.
Western Bank.....					2,131,261	\$32,791	145,970	\$3,930
Queereen Bank.....	138	\$12			5,047,891	85,717	322,309	9,935
Green Bank.....					1,526,694	56,707	1,807,562	62,720
Grand Bank.....					144,450	7,034	24,889	734
St. Peters Bank.....					1,071,348	60,307	52,318	768
Sambo Bank.....					7,015	568	21,120	688
Burgo Bank.....					268,020	3,527	690	19
Bacallen Bank.....					130,572	6,184	893	28,135
Off Newfoundland.					37,650	2,036	75,730	151,859
Cape North.....	a 1,770,150	53,075	b 8,931,550	\$186,819	1,861,933	56,734	10,398,261	2,639
Cape Shore.....	9,936	696			2,500	164	72,710	4,075
Gulf of St. Lawrence.					1,281,269	27,829	788,045	2,438
St. Ann's Bank.....					85,022	85,022	28,744	56,573
The Gully.....					564,395	9,152	144,650	229,672
Labrador Coast.....					568,440	28,087	619,780	10,866
							651,105	31,215
							120,126	9,290
West of 66° west longitude.								
Browns Bank.....					4,436,612	67,425	93,166	2,829
Georges Bank.....					7,990,685	108,040	2,236,766	87,145
Cashes Bank.....					473,353	5,766		193,185
Fippenies Bank.....					20,955	253		5,766
Middle Bank.....	5,250	81			665,036	30,549	1,002,700	253
Jeffreys Ledge.....					191,600	2,613		113,560
Inswich Bay.....	16,100	64			141,890	2,420		2,613
South Channel.....					796,700	8,338		2,420
Nantucket Shoals.....					182,151	2,980		8,338
Off Race Point.....					13,600	945		12,842
Bay of Fundy.....					53,180	567		15,600
Shore, general.....	2,847,995	30,824			15,956,581	320,524	991,881	1,085
Total.....	4,649,569	84,752	8,931,550	186,819	49,677,980	1,012,279	73,606,241	389,617
Grand total.....	10,458,913	398,865	8,931,550	186,819	147,075,265	3,900,633	171,595,728	1,826,603
							4,737,917	

<sup>a</sup> Herring, 1,768,150 pounds, value \$53,045; and caplin, dried, 2,000 pounds, value \$30.

<sup>b</sup> Herring, 8,990,800 pounds, value \$186,723; and salmon, 750 pounds, value \$36. Other items under "Miscellaneous" include bluebacks, 707,970 pounds, value \$5,686; butterfish, 316,234 pounds, value \$7,370; catfish or wolfish, 179,999 pounds, value \$3,197; flounders, 652,172 pounds, value \$29,884; herring, 1,977,620 pounds, value \$20,381; horse mackerel, 671 pounds, value \$27; redfish, 88,694 pounds, value \$1,134; pad, 421,701 pounds, value \$8,027; sharks, 24,416 pounds, value \$240; skates, 114,876 pounds, value \$1,428; swordfish, 2,238,567 pounds, value \$221,559; tilefish, 25,518 pounds, value \$1,102; whiting, or silver hake, 4,800 pounds, value \$48; porpoise, 200 pounds, value \$6; lobster, 6,000 pounds, value \$1,086; turtle, 75 pounds, value \$3; livers, 1,153,460 pounds, value \$16,688; sounds, 100,680 pounds, value \$8,947; spawn, 70,213 pounds, value \$6,029; and tongues, 1,500 pounds, value \$75.

QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS  
DURING THE YEAR 1915, SHOWN BY MONTHS.

Months.	Number of trips.	Cod.					
		Large (10 pounds and over).			Market (under 10 and over 2½ pounds).		
		Fresh.		Salted.	Fresh.		Salted.
		Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
LANDED AT BOSTON.							
January.....	213	521,945	\$18,874			97,582	\$1,328
February.....	213	395,844	19,025			67,667	1,068
March.....	276	728,602	31,226			78,454	1,184
April.....	224	704,191	19,101			64,495	759
May.....	233	1,029,552	44,207			91,000	930
June.....	318	490,456	27,808			135,247	1,414
July.....	425	578,066	30,251			93,381	1,154
August.....	400	549,639	31,694			94,489	1,290
September.....	388	484,308	28,457			124,661	1,518
October.....	477	420,340	27,107			92,022	1,574
November.....	357	372,504	22,557			85,864	1,430
December.....	248	416,205	17,120			84,895	1,208
Total.....	3,772	7,181,682	317,507			1,109,757	14,857
LANDED AT GLOUCESTER.							
January.....	243	370,890	12,160			15,725	118
February.....	127	89,351	4,131			4,820	36
March.....	362	330,730	11,817			6,420	59
April.....	1,285	754,784	28,612			34,539	262
May.....	292	898,669	18,612			53,904	416
June.....	225	1,311,015	25,137			33,509	1,905
July.....	154	834,553	18,556			22,070	190
August.....	200	790,938	15,345			31,965	314
September.....	181	775,313	14,318			27,327	209
October.....	224	259,758	5,978			25,845	203
November.....	453	254,963	9,799			11,815	93
December.....	389	184,918	6,097			28,696	49
Total.....	3,472	7,386,852	170,397			6,680	50
Grand total.....	7,244	14,568,534	487,904			255,709	2,057
Grounds E. of 66° W. long.							
Grounds W. of 66° W. long.	595	5,536,297	120,563			1,365,466	16,914
Landed at Boston in 1914.....	6,649	9,032,237	367,341			257,647	2,473
Landed at Gloucester in 1914.....	3,389	8,019,801	325,323			1,107,819	14,441
	4,209	5,843,388	152,554			1,012,441	14,904
						557,820	4,468
							400,036





Months.	Pollock.				Cusk.				Halibut.			
	Fresh.		Salted.		Fresh.		Salted.		Fresh.		Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
LANDED AT BOSTON.												
January.....	222,014	\$5,505	.....	.....	213,707	\$3,902	.....	.....	19,083	\$1,967	.....	.....
February.....	143,595	5,199	.....	.....	499,862	8,195	.....	.....	46,330	7,183	.....	.....
March.....	211,215	5,586	.....	.....	501,277	8,187	.....	.....	109,151	12,647	.....	.....
April.....	135,746	2,714	.....	.....	285,273	4,078	.....	.....	135,177	13,171	.....	.....
May.....	229,943	3,567	.....	.....	239,308	3,108	.....	.....	72,318	2,218	.....	.....
June.....	599,389	10,596	.....	.....	142,677	2,178	.....	.....	239,679	18,509	.....	.....
July.....	661,652	13,767	.....	.....	102,040	1,678	.....	.....	54,734	6,085	.....	.....
August.....	671,647	18,398	.....	.....	91,705	1,654	.....	.....	101,307	11,501	.....	.....
September.....	553,840	18,468	.....	.....	251,139	3,841	.....	.....	61,432	4,795	.....	.....
October.....	529,300	14,256	.....	.....	284,806	4,693	.....	.....	46,515	6,566	.....	.....
November.....	188,206	3,406	.....	.....	292,505	5,010	.....	.....	25,363	5,416	.....	.....
December.....	137,900	2,271	.....	.....	417,382	6,603	.....	.....	18,720	4,269	.....	.....
Total.....	4,284,447	103,733	.....	.....	3,321,681	53,127	.....	.....	930,409	102,327	.....	.....
LANDED AT GLOUCESTER.												
January.....	294,600	8,824	4,065	\$61	51,325	907	490	\$12	79,546	9,027	230	\$23
February.....	74,488	3,199	2,200	3	38,827	1,752	450	10	123,520	9,139	20	2
March.....	284,541	7,032	2,489	38	103,650	1,551	2,760	69	407,347	34,205	455	46
April.....	373,147	7,782	3,595	63	434,335	6,863	4,962	124	440,169	29,018	65	7
May.....	583,211	5,607	25,600	458	410,385	6,269	130	3	136,528	11,272	3,818	382
June.....	129,498	1,276	56,392	987	150,275	2,255	16,036	398	451,662	24,942	98,621	6,252
July.....	31,610	310	64,040	1,094	278,117	4,000	12,100	302	255,951	19,596	18,685	1,121
August.....	68,385	616	36,800	643	400,537	5,649	13,113	327	274,850	20,464	5,200	313
September.....	73,025	730	16,346	292	688,757	9,644	14,575	365	221,931	14,767	56,926	4,680
October.....	449,235	5,609	15,462	272	318,513	4,413	18,935	452	143,672	13,617	102,151	8,673
November.....	4,010,630	64,847	11	11	27,674	378	10,775	270	90,880	10,245	339	30
December.....	2,304,496	39,623	9,035	148	11,725	165	617	15	27,410	3,148	.....	.....
Total.....	8,676,866	145,455	234,640	4,070	2,914,120	42,876	94,943	2,347	2,653,766	199,460	288,510	21,509
Grand total.....	12,961,313	249,188	234,640	4,070	6,235,801	96,003	94,943	2,347	3,584,175	301,787	286,510	21,509
Grounds E. of 66° W. long.....	198,076	2,963	54,635	957	1,070,590	23,902	53,797	1,335	2,884,095	217,505	286,205	21,488
Grounds W. of 66° W. long.....	12,765,237	246,225	180,005	3,113	4,565,211	72,101	41,146	1,012	700,080	84,282	305	21
Landed at Boston in 1914.....	4,655,089	90,372	.....	.....	2,668,546	45,970	.....	.....	826,836	88,441	.....	.....
Landed at Gloucester in 1914.....	7,588,457	106,150	211,177	4,214	3,078,507	53,577	111,937	3,232	2,236,164	137,836	316,585	30,073



Months.	Miscellaneous. <sup>a</sup>				Total.		Grand total.		
	Fresh.		Salted.		Fresh.			Salted.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.		Pounds.	Value.
LANDED AT BOSTON.									
January.....	529,461	\$15,486	6,579,265	\$187,655	6,579,265	\$187,655	6,579,265	\$187,655	
February.....	329,574	12,117	7,902,937	248,159	7,902,937	248,159	7,902,937	248,159	
March.....	172,210	5,992	8,728,754	244,423	8,728,754	244,423	8,728,754	244,423	
April.....	61,120	1,235	6,191,033	125,113	6,191,033	125,113	6,191,033	125,113	
May.....	174,383	2,838	5,941,033	141,404	5,941,033	141,404	5,941,033	141,404	
June.....	544,399	31,046	9,717,558	299,305	9,717,558	299,305	9,717,558	299,305	
July.....	1,200,904	85,702	8,871,604	326,394	8,871,604	326,394	8,871,604	326,394	
August.....	824,559	61,267	10,101,783	296,072	10,101,783	296,072	10,101,783	296,072	
September.....	901,024	54,703	11,295,493	290,945	11,295,493	290,945	11,295,493	290,945	
October.....	634,153	30,321	11,295,190	313,336	11,295,190	313,336	11,295,190	313,336	
November.....	239,604	6,905	6,067,274	228,892	6,067,274	228,892	6,067,274	228,892	
December.....	197,953	6,501	5,775,359	186,656	5,775,359	186,656	5,775,359	186,656	
Total.....	5,809,344	314,113	97,397,285	2,888,354	97,397,285	2,888,354	97,397,285	2,911,314	
LANDED AT GLOUCESTER.									
January.....	1,770,150	53,075	2,495,586	\$38,379	98,044	2,660,700	45,090	143,134	
February.....	.....	.....	613,025	24,506	24,506	36,210	1,296	649,235	
March.....	.....	.....	2,076,759	73,031	73,031	123,123	5,367	2,199,882	
April.....	.....	.....	5,621,395	116,149	116,149	609,952	22,525	6,231,347	
May.....	120,000	1,837	4,175,569	69,409	69,409	454,558	16,723	4,630,127	
June.....	543,400	6,332	5,016,361	89,231	89,231	3,604,678	126,704	5,041,339	
July.....	1,364,730	13,464	4,670,109	84,114	84,114	3,170,753	114,887	4,784,992	
August.....	545,210	4,500	6,846,825	116,972	116,972	1,620,787	68,558	7,467,380	
September.....	244,620	2,050	8,466,353	107,797	107,797	2,076,027	91,705	8,542,380	
October.....	10,638	117	3,499,283	84,911	84,911	2,418,598	38,451	2,456,716	
November.....	18,246	844	4,703,760	94,645	94,645	861,678	38,451	3,580,736	
December.....	7,600	587	2,784,380	55,570	55,570	6,381,197	150,478	3,934,237	
Total.....	27,975	1,946	6,124,434	141,448	141,448	24,018,261	814,324	73,696,241	
Grand total.....	4,649,569	84,752	8,931,550	186,819	49,677,980	24,018,261	814,324	73,696,241	
Grounds E. of 66° W. long.....									
Grounds W. of 66° W. long.....									
Landed at Boston in 1914.....									
Landed at Gloucester in 1914.....									
January.....	3,342,694	146,229	8,931,550	186,819	28,710,215	19,659,246	569,070	48,369,461	
February.....	7,116,219	252,636	.....	.....	118,365,050	4,281,217	268,214	123,226,267	
March.....	4,646,219	251,003	70,000	2,100	92,231,172	113,020	4,110	92,344,192	
April.....	5,685,365	118,734	5,765,764	106,528	49,343,823	20,901,205	749,274	70,245,028	

<sup>a</sup> Includes herring from Newfoundland, 2,363,150 pounds frozen, \$68,945, and 8,930,800 pounds salted, \$186,783.

The fish landed at Boston and Gloucester, Mass., by American fishing vessels are taken principally from fishing grounds lying off the coast of the United States. In 1915, 71.78 per cent of the quantity and 70.74 per cent of the value of the catch landed by the American fishing fleet at these ports were obtained from these grounds. Of the remainder, 9.41 per cent of the quantity and 9.70 per cent of the value were taken from fishing banks off the coast of Newfoundland, 18.73 per cent of the quantity and 19.35 per cent of the value from grounds off the Canadian Provinces, and less than 1 per cent of both the quantity and value from the coast of Labrador. Newfoundland herring constituted 6.58 per cent of the quantity and 5.39 per cent of the value of the products landed at these ports during the year. The herring were taken on the treaty coasts of Newfoundland, but cod and other species from that region were obtained chiefly from fishing banks on the high seas. All the fish caught by American fishing vessels off the Canadian Provinces were from offshore fishing grounds. The catch from each of these fishing regions is given in detail in the following table:

QUANTITY AND VALUE OF FISH LANDED BY AMERICAN FISHING VESSELS AT BOSTON AND GLOUCESTER, MASS., IN 1915, FROM GROUNDS OFF THE COAST OF THE UNITED STATES, NEWFOUNDLAND, AND CANADIAN PROVINCES.

Species.	United States.		Newfoundland. <sup>a</sup>		Canadian Provinces.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Cod:								
Fresh.....	23,695,413	\$689,361	484,815	\$9,962	9,907,896	\$189,529	34,088,124	\$888,852
Salted.....	1,876,888	71,419	3,009,390	105,146	6,081,495	207,543	10,967,773	384,108
Haddock:								
Fresh.....	51,712,661	1,185,386	100	1	6,100,289	120,065	57,813,050	1,305,452
Salted.....	69,675	1,235	14,075	246	46,844	880	130,594	2,361
Hake:								
Fresh.....	11,248,569	232,237	54,860	704	3,285,886	44,529	14,589,315	277,470
Salted.....	24,713	428	91,200	1,450	184,712	3,129	300,625	5,007
Pollock:								
Fresh.....	12,762,282	246,213	665	12	198,366	2,963	12,961,313	249,188
Salted.....	180,005	3,113	7,865	138	46,770	819	234,640	4,070
Cusk:								
Fresh.....	4,550,491	71,946	3,345	52	1,681,965	24,005	6,235,801	96,003
Salted.....	41,146	1,012	5,387	133	48,410	1,202	94,943	2,347
Halibut:								
Fresh.....	699,496	84,225	1,149,408	84,014	1,735,271	133,548	3,584,175	301,787
Salted.....	305	21	145,665	11,304	140,540	10,184	286,510	21,509
Mackerel:								
Fresh.....	6,534,400	321,778	-----	-----	810,174	61,238	7,344,574	383,016
Salted.....	2,668,485	190,986	-----	-----	905,343	40,077	3,573,828	231,063
Herring:								
Fresh.....	1,977,620	20,381	2,368,150	68,945	-----	-----	4,345,770	89,326
Salted.....	-----	-----	8,930,800	186,783	-----	-----	8,930,800	186,783
Swordfish:								
Fresh.....	1,307,317	145,155	868	68	930,782	76,336	2,238,967	221,559
Miscellaneous:								
Fresh.....	3,830,532	87,084	2,000	30	41,644	866	3,874,176	87,980
Salted.....	-----	-----	750	36	-----	-----	750	36
Total....	123,179,998	3,351,980	16,269,343	469,024	32,146,387	916,913	171,595,728	4,737,917

<sup>a</sup> Includes 17,975 pounds of salted cod, valued at \$617, and 102,151 pounds of salted halibut, valued at \$8,673, from the Labrador coast.

*Cod.*—In 1915 there were 33 vessels employed in the salt-bank fishery and 102 in the market fishery landing their fares at Boston and Gloucester. Considerable cod was landed also by vessels operating on shore grounds. There were landed at these ports 45,055,897 pounds of fresh and salted cod, 34,088,124 pounds of the former and 10,967,773 pounds of the latter, valued at \$1,272,960, against 47,529,625 pounds in 1914, of which 36,079,873 pounds were fresh and

11,449,752 pounds salted, valued at \$1,359,416. There was, therefore, a decrease in the quantity in 1915, as compared with the previous year, of 1,991,749 pounds in the fresh and 481,979 pounds in the salted cod landed.

Several large fares of cod were caught during the season of 1915. A trip amounting to 359,483 pounds taken on trawl lines was landed at Gloucester in July, and one of the dory hand-line fleet brought in 478,365 pounds in September, this being the largest fare taken since 1909, when the same vessel weighed off 479,433 pounds.

*Haddock.*—The haddock fishery in 1915 was carried on with about the same success as in the previous year. The quantity of haddock landed was 57,943,644 pounds, valued at \$1,307,813, an increase over the previous year of 189,516 pounds in quantity and a decrease of \$73,343 in value. The catch of haddock by line trawlers landed at Boston amounted to 30,776,733 pounds, of which 16.57 per cent were "scrod." The greater part of the scrod haddock brought in by line trawlers came from the inshore grounds, the offshore banks supplying a greater proportion of large haddock. On the inshore grounds the amount of scrod haddock taken varied from 18 to 22 per cent of the total catch and on the offshore grounds from 2 to 8 per cent.

*Pollock.*—The pollock fishery, which in recent years has supported a considerable fleet of small craft employing purse seines as a means of capture, was carried on with greater success than in 1914. The total catch of pollock landed at Boston and Gloucester, including those taken on hand and trawl lines and in gill nets, was 13,195,953 pounds, having a value of \$253,258, an increase of 741,230 pounds in quantity and \$53,522 in value compared with 1914. As in previous years, most of the pollock landed by purse seiners and gill netters were caught in spring and fall months.

*Halibut.*—In the last few years the halibut fishery on the Atlantic coast has fluctuated but little. The yield of fresh and salted halibut in 1915 was 3,870,685 pounds, 3,584,175 pounds of the former and 286,510 pounds of the latter, valued at \$323,296, an increase of 491,100 pounds and \$46,946 over 1914. The largest catches of this species were made on Georges, Browns, La Have, Quereau, Western, and Grand Banks, the last-mentioned bank supplying the greatest amount. The fishery was conducted throughout the year, but the bulk of the catch was taken during the early spring and summer months. The vessels regularly employed in this fishery numbered 33 sail, although many of the cod hand-line and trawl-line fishermen frequently caught halibut in considerable quantities. The usual activity was displayed in this fishery in the spring of 1916. At the end of May the fleet engaged numbered 26 vessels, and a considerable number of fairly large fares were landed.

*The otter-trawl fishery.*—This method of fishing, as in 1914, was carried on by 12 steamers. With the exception of several trips landed at Portland and an occasional trip disposed of at Gloucester during such times when there was a glut of fresh haddock in the market, the bulk of fish caught by otter trawlers was landed at Boston. The year's catch was 21,116,300 pounds, representing 380 trips, an increase of 8 trips. There were landed from Georges 105 trips, from South Channel 248, Western Bank 26, and Browns Bank 1. As in the previous year, Western Bank was resorted to in March, April, and May, when haddock were less plentiful on Georges and

in the South Channel than during the winter months. Of the total quantity of fish landed at Boston by this class of vessels, 17,062,732 pounds were haddock, of which 39.28 per cent were "scrod." The great disparity in the landings of small fish by this method as compared with line trawls is confined wholly to haddock, the large and small fish of other species caught by the two methods, such as cod, cusk, and hake, being more equally divided.

On July 20, 1915, the otter trawler *East Hampton* landed at Gloucester 310,000 pounds of fresh fish, most of which were haddock. The largest trip previously brought in was 300,000 pounds, caught by the otter trawler *Long Island*. These were the largest fares ever taken by American otter trawlers.

*Mackerel.*—The amount of salted mackerel taken in 1915 was 19,691 barrels, exceeding the catch of the previous year by 4,170 barrels. The catch off the New England coast was 15,480 barrels and on the Cape Shore, including a few fares from the Gulf of St. Lawrence, 4,211 barrels, or 750 barrels less than was taken in those regions in 1914. The total catch of fresh mackerel by the fleet was 71,564 barrels, compared with 68,582 barrels the previous season. The number of fresh mackerel taken on the Cape Shore was 781,000, which exceeded the catch of 1914 by over 200,000 fish. In the fall of 1915 several vessels of the seining fleet made phenomenal catches in Massachusetts Bay, one vessel making a stock of \$6,548 in three weeks, at which time it was reported that a much larger body of mackerel was on the coast than had been observed for several years.

The mackerel fishery in the spring of 1916 showed a marked improvement over that of 1915, the catch up to May 15 being nearly double the amount recorded the previous season on the same date. Three vessels of the seining fleet stocked over \$9,000 each and one \$11,246, the last-mentioned stock being \$2,361 more than the highest made by a single vessel to the end of May, 1915. There were engaged in the southern mackerel fishery 24 seiners and 58 netters. Fifteen of the latter sailed from Gloucester and 43 from other ports. The number of seiners was one less than in 1915, but there was an increase of 41 netters. A portion of the seining fleet sailed on March 24, but none of the netters sailed until April 25. The first mackerel of the season of 1916, amounting to 7 barrels, were caught on April 5 about 80 miles east by south from Cape Henlopen, or practically in the same locality where the first fish were encountered the previous season. The fish were landed at Lewes, Del., from which place they were shipped to New York by rail. Other small trips were caught in the same region within a few days, but the first fare of any considerable size was landed at New York on April 26, one vessel bringing in 41,800 fish, followed the next day by the arrival of 6 vessels with trips ranging from 6,000 to 40,000 fish. From this time until the middle of May the supply of mackerel in the New York market was about equal to the demand. For the week ended May 3 the amount of fresh mackerel landed was 553,000 in number, mostly large and medium, compared with 268,576 fish last year, which were mostly small. Many of the large mackerel in April sold for 40 cents each. The average price ranged from 12 to 20 cents for large and medium, while tinkers brought from 3 to 6 cents a pound.

On May 31 there were 1,200 mackerel landed at Boston, the first fare of the season. Four vessels of the seining fleet sailed for the

Cape Shore May 25, and on June 6 the number had increased to 24 sail. The first mackerel of the season from this region were landed at Boston on June 9, the trip consisting of 10,000 large and 35,000 medium fresh mackerel and 170 barrels salted. On June 10 there were 3 other arrivals from the Cape Shore with fares taken off Halifax and Liverpool, the combined catch amounting to 125,000 of mixed fresh mackerel and 230 barrels salted. At that time there were 15 other seiners on the ground, all of which captured schools of mackerel. Mackerel were reported plentiful on the Cape Shore until June 21, and many large trips were taken. The highest stock made by a single vessel in this region was \$6,343, which is the largest recorded for one trip in recent years. Fish were also abundant during the month on grounds in the vicinity of No Mans Land, the entire fleet of seiners and netters fishing in that locality doing well.

*Swordfish.*—This species was more plentiful in 1915 than in the previous year, and 2,238,967 pounds, having a value of \$221,559, were landed at Boston and Gloucester, an increase of 739,123 pounds and \$43,860 over 1914. There were 42 vessels engaged in the fishery, operating mostly on the more eastern grounds, although some good catches were made on Georges, Nantucket Shoals, and adjacent grounds. On July 20, 17 vessels landed at the Boston Fish Pier 1,126 swordfish that had been taken on Georges. This was probably the greatest number of swordfish ever landed at an American port in one day.

*Winter gill-net fishery.*—The winter gill-net fishery practically ceased at the end of May. A fleet of 30 vessels was employed at Gloucester during the season, and there were a few vessels that operated out of other ports. Fishing was conducted on the inshore grounds along the New England coast from Cape Ann to Portland. As in previous years, the principal species taken by this method were cod, haddock, and pollock. While the fleet as a whole did not meet with the same degree of success as in some years past, the fishery was an improvement over the previous season. Several good stocks were made, one vessel making \$30,000, with a share of \$1,500 to each member of the crew. This was probably the highest record ever attained in one season by a vessel engaged in the winter gill-net fishery.

*Italian fishing boats.*—The number of Italian motor boats fishing out of Boston and landing their catch at that port has increased in the last few years. At the present time there are approximately 200 boats of this class engaged in the shore fisheries, all of which are too small for registration, being under 5 tons, and in consequence their catch is not recorded in the Boston and Gloucester bulletins. These boats take a variety of species and operate several kinds of fishing gear, namely, trawl lines, hand lines, and drag seines.

Some ten years ago the catch of this class of boats consisted largely of flounders, but in the last few years greater efforts have been made to capture other species of ground fish, such as cod, haddock, cusk, hake, etc. Mackerel also have been taken to some extent. In 1915 the Italian catch landed at Boston, and sold through the New England Fish Exchange, was over 3,500,000 pounds of fish, valued at \$135,000. The catch consisted largely of cod, haddock, pollock, hake, and cusk. The amount of flounders landed was about 36,000 pounds.

## PACIFIC HALIBUT AND COD FISHERIES.

The halibut banks off Oregon and Washington, recently surveyed by the steamer *Albatross*, were resorted to during the month of June, 1915, by a portion of the halibut fleet sailing out of Seattle, from which grounds 26 trips of halibut were taken in that month, comprising 1,318,000 pounds, valued at \$64,623. As halibut were scarce on these grounds in the summer months, the remainder of the catch of that species landed at Seattle from June to December was taken from banks farther north, extending from Flattery Bank, off the coast of Washington, to Portlock Bank, Alaska. This amounted to 13,876,970 pounds, having a market value of \$820,585. In the first half of the calendar year 1916, 25 fares were brought from the banks off Oregon and Washington, amounting to 931,692 pounds, valued at \$77,819. The total quantity of halibut landed at Seattle during that period, including the catch from banks farther north, was 7,391,384 pounds, valued at \$608,947, taken in 274 trips.

According to the Pacific Fisherman, the total catch of halibut on the Pacific coast by American vessels in 1915 was 50,238,390 pounds, of which 33,133,313 pounds were landed at Seattle, 11,323,500 pounds in Canadian ports, and 5,781,577 pounds in Alaska, against 48,902,575 pounds the preceding year, a gain of 1,335,815 pounds. The American fleet engaged in this fishery consisted of 100 sail, known as "independent" and "company" vessels, there being 89 of the former and 11 of the latter, ranging in size from 7 to 196 tons. The Canadian fleet comprised 27 vessels, the catch of which amounted to 16,031,265 pounds, an increase of 1,074,465 pounds over 1914.

The fleet employed in the cod fishery of the Pacific coast numbered 20 sail, including 2 vessels engaged in transporting cured fish from the shore stations in Alaska. Three regions were represented in the fishery—San Francisco by 9 vessels, Puget Sound by 8 vessels, and Alaska by 3 vessels. One of the Alaskan vessels was lost in the early part of the season. The fleet met with very good success and made a catch of 3,798,071 fish, equivalent to 19,092,319 pounds, the fish being reckoned at 4½ pounds each. The catch fell short of that of 1914 by 122,831 fish, or 552,739 pounds.

The work of collecting statistics of the quantity and value of fishery products landed at Seattle, Wash., by American fishing vessels was reestablished in June, 1915, by the appointment of a local agent at that port. The products landed from July, 1915, to June, 1916, comprised 513 trips, including 19,580,163 pounds of halibut, valued at \$1,330,609, and 948,024 pounds of other species, valued at \$23,285; a total of 20,528,187 pounds, valued at \$1,353,894. The monthly receipts by species are shown in the following table:



## QUANTITIES AND VALUES OF CERTAIN FISHERY PRODUCTS LANDED AT SEATTLE, WASH., BY AMERICAN FISHING VESSELS DURING THE FISCAL YEAR 1916.

Month.	Number of trips.	Halibut.		Cod.		Black cod.	
		Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1915.							
July.....	61	2,700,430	\$152,859			39,300	\$855
August.....	36	1,698,288	92,253	645	\$10	8,860	217
September.....	53	2,172,000	132,496	1,312	20	332,000	8,300
October.....	31	1,644,792	103,952			130,545	3,164
November.....	30	2,312,527	147,994			17,000	425
December.....	28	1,660,742	92,108			26,000	650
1916.							
January.....	8	923,055	68,049			18,000	360
February.....	7	706,931	47,669			16,232	443
March.....	31	815,209	82,226	60	1	16,175	484
April.....	61	1,207,372	130,438			10,566	318
May.....	89	2,024,105	129,672			84,955	2,124
June.....	78	1,714,712	150,893			200,233	4,883
Total.....	513	19,580,163	1,330,609	2,017	31	899,866	22,223

Month.	Ling cod.		Rock cod.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1915.						
July.....					2,739,730	\$153,714
August.....			1,000	\$15	1,708,793	92,496
September.....					2,505,312	140,816
October.....			10,000	250	1,785,337	107,366
November.....					2,329,527	148,419
December.....					1,686,742	92,758
1916.						
January.....					941,055	68,409
February.....					723,163	48,112
March.....					831,444	82,711
April.....	6,006	\$120	11,413	293	1,235,357	131,160
May.....					2,109,060	131,796
June.....	11,732	230	5,990	123	1,932,667	156,129
Total.....	17,738	350	28,403	681	20,528,187	1,353,894

<sup>a</sup> Includes 5,000 pounds of salt halibut, worth \$125, landed in August. The remainder of the catch was sold fresh.

## PROMOTION OF AMERICAN CAVIAR.

One of the most valuable of all fishery products is caviar, which is prepared from the roe of sturgeon primarily, but also from that of the paddlefish of the Mississippi Valley, and sometimes, under appropriate descriptive names, from the eggs of carp, whitefish, and other species. The product has always been imported extensively, while it is known that suitable material in this country is often wasted through ignorance of the fishermen as to the methods of preservation to employ. After a suitable investigation of the matter, the Bureau issued an economic circular describing in simple language the methods which may be efficiently employed by any fisherman. The paper had the twofold object of preventing unnecessary waste through ignorance or neglect and of awakening a more effective interest in the protection of the sturgeon and the paddlefish.

## INTRODUCTION OF NEW AQUATIC FOODS.

One of the most useful ways in which the Bureau of Fisheries can serve the fishermen and the general fish-eating public is to make known new sources of aquatic foods and to assist in establishing fisheries and markets therefor. The conspicuous success achieved in the case of the sea mussel has been referred to in previous reports. This excellent, abundant, accessible, cheap, and widely distributed shellfish, formerly neglected, has now become a staple in certain important markets. Various other water products of great prospective value, but now largely unutilized, should be exploited as speedily as possible, but the limited funds and facilities at the disposal of the Bureau for such work make it impossible to conduct an active campaign with more than one or two such articles at one time. In the fiscal year 1916 one hitherto neglected fish has been given a permanent and important place in the fisheries and fish trade by the Bureau's efforts, and a campaign of great prospective consequence has been inaugurated with reference to several others.

In October, 1915, the Bureau undertook to popularize the tilefish in the belief that it is a fish of great prospective food value. Its utilization had been advocated years ago, but the efforts to introduce it were not sufficiently comprehensive or sustained to bring success, and the fish in reality came into some disrepute because of the failures that attended the attempts to give it a commercial status. The task confronting the Bureau was to induce fishermen to catch the fish, dealers to handle the fish, and the public to consume the fish, and to bring all this about simultaneously. The effective methods pursued made it possible for the Government to withdraw from the campaign within one month and to intrust future developments to private enterprise.

The essential feature of the exploit was the chartering of a regular fishing vessel with practical fishermen as its crew. The auxiliary schooner *Stranger*, of Gloucester, carrying 12 men, was the vessel selected for the purpose. The Bureau had guaranteed the *Stranger* \$1,500 for one month's service, but in 27 days she caught 38,383 pounds of tilefish, which, after deducting commissions, sold for \$2,036.63; and not only was the Bureau at no expense whatever for the fishing operations, but the proceeds, taking no account of several thousand pounds gratuitously distributed for advertising purposes, yielded a substantial bonus to the crew over their regular remuneration.

When the wholesale trade of New York was requested to cooperate in the proposed campaign, the unfortunate past stood in the way of immediate acquiescence. "There is no demand for the fish," said the dealers, but the Bureau explained that getting the fish and creating a demand were its part of the work and that all that was desired of the trade was a cheerful willingness to handle the fish to satisfy such demand as might develop. When the first fare was landed in New York on October 22, four or five dealers in Fulton Market rather reluctantly agreed to handle the fish, some of which were given away and the remainder sold for 5 cents per pound. When the fourth trip arrived but 20 days later, 15 dealers were competing for the fish, which sold for 7 cents. In the interval a demand had arisen which no large wholesale or commission house could afford to ignore. This demand was created solely by an advertising campaign which kept the fish constantly be-

fore the public and concentrated attention on its points of interest and excellence. Newspapers were furnished items recounting the unusual history of the fish—its discovery, practical extermination, and reappearance; incidents in the campaign were exploited; fish were more or less conspicuously supplied to prominent persons; leading hotels and restaurants were induced to give the tilefish prominence on their menus; a great motion-picture company placed a camera man on the *Stranger* and exhibited motion pictures of the fishery as a feature of its weekly news reel; and the Bureau's own advertising matter was distributed freely.

The propaganda conducted in behalf of this fishery covered practically the entire field. The fishing grounds were found and pointed out to fishermen; a regular commercial fishing vessel was engaged to demonstrate the financial yield of this fishery under regular industrial conditions; the wholesale trade was enlisted in the distribution of the fish; the retailer was furnished with attractive display advertising matter calling his customers' attention to the fact that the fish was on sale; and the consumer was told about the tilefish and how to cook it, and his curiosity and interest were stimulated to the point where he wished to try it and asked his dealer for it. As a consequence, when the Bureau ceased its fishing operations, other vessels were already at work, and within 10 days of the landing of the last fare by the *Stranger* eight schooners were either in the fishery or about to enter it and by the end of the month had landed in New York about 156,000 pounds of tilefish.

The progress of this fishery has far exceeded expectations. While New York continues to be the center of the industry, Boston, Atlantic City, Newport, and other places have become practically interested by putting vessels in the fishery. At the end of June, 1916, the New York fleet consisted of 13 vessels making regular trips to the fishing grounds, although earlier in the season a number of other vessels were engaged. The catch has varied from month to month, but has shown a general upward trend as increased fares were brought in to meet the growing demand, and the yield in June exceeded that of any preceding month, aggregating over 1,221,000 pounds landed at New York in 28 fares. A new record was made in July, 1916, when 2,200,000 pounds were landed at New York, 230,000 at Boston, and various minor fares at other ports.

By the end of the fiscal year 1916, when the fishery was only eight months old, upward of 4,388,500 pounds of tilefish, which brought the fishermen over \$210,000, were caught and sold. The monthly receipts at New York were as follows:

Months.	Pounds.	Months.	Pounds.
November, 1915.....	156,500	April, 1916.....	626,000
December, 1915.....	170,200	May, 1916.....	620,000
January, 1916.....	398,000	June, 1916.....	1,221,000
February, 1916.....	469,000		
March, 1916.....	615,000	Total.....	4,275,700

The tilefish grounds extend along the edge of the continental shelf from a point south of Nantucket to an area east of Atlantic City. Few fish have been taken in depths over 100 fathoms, and the best

fish are in from 60 to 65 fathoms of water. Tilefish are not particular as to the kind and quality of bait offered them. While squid, bluebacks, menhaden, clams, etc., are very acceptable, they will bite freely on inferior kinds of bait, making the bait question comparatively easy to solve.

The fishery has proved a great deal more remunerative than was at first expected by most fishermen and is now considered by them as being well established. The prices received by the fishermen have at times been as high as 7 cents a pound and as low as 1½ cents, the average being about 5 cents. The fish bears shipment perhaps better than any other staple fish of the Atlantic coast and now reaches consumers all over the eastern half of the country. Some large shipments have gone as far west as Kansas City. The catch in recent months has been at the rate of 20,000,000 pounds per annum.

Following long consideration and much discussion, the present Congress has passed an act, approved June 21, 1916, which provides a way of alleviating the losses sustained by the fishermen, more especially those of the Atlantic coast, from the ravages of dogfishes. The act carries an appropriation of \$25,000 to enable the Commissioner of Fisheries to conduct investigations and experiments to this end, and the method of procedure, as recommended by the Bureau and understood by Congress, is to make the dogfishes useful. Mistaken economic and biological conceptions as to the possibility of bringing about the extermination of dogfishes have been abandoned, and all persons now interested in the welfare of the fishermen and the advancement of the fisheries are united in the efforts that will be made, under authority of law, to convert an injurious and hitherto useless article into a valuable asset. While the dogfishes and other sharks yield by-products, such as oil, gelatin, and leather, of undoubted economic importance, their principal utility comes through their known value as food. The task before the Bureau is to overcome the deep-seated prejudice that exists against these fishes and to determine the ways and means for creating a demand for fresh and preserved dogfish that will react on the fishermen and enable them to market their catch at a profit.

#### ALASKA FISHERIES SERVICE.

##### EXTENT OF THE ALASKAN FISHERIES.

The enormous fishing industry in Alaska over which the Bureau exercises administrative jurisdiction was in some respects more extensive in the calendar year 1915 than ever before. The number of persons engaged in all branches was 22,462, an increase of more than 1,200 over 1914; the investment was \$37,316,560, an increase of upward of a quarter of a million dollars over the previous year; and the value of the output as placed on the market was \$20,999,343, a decrease of nearly a quarter of a million dollars compared with 1914, which year registered the highest value attained by the industry. The quantity of fishery products taken in 1915 was greater than in any previous season, but lower prices prevailed for several grades of salmon taken in large numbers.

The salmons continue to overshadow all other fishes in Alaska, and the industry they support represents 86 per cent of the capital

invested and nearly 80 per cent of the persons employed, while the salmon output is worth more than 91 per cent of the total value of all fisheries. The salient features of the salmon industry in 1915 were the extraordinary abundance of humpbacks in southeast Alaska, the large run of cohos in central and west Alaska, the lighter run of redfish in west and southeast Alaska, and the increased abundance in central Alaska. The value of all salmons as prepared for sale was \$19,214,145, of which \$18,653,015 represented canned fish. The number of salmon taken was 63,537,244, of which 30,896,394 were humpbacks and 25,878,811 were redfish. The canned-salmon pack was the largest in the history of the Territory, amounting to 4,500,293 cases of 48 1-pound cans, an increase of 443,640 cases over 1914, which was the previous record. The canneries operated numbered 85, against 81 in 1914.

Other fishes in the order of importance were the halibut, with an output of \$781,011; the cod, valued at \$390,199; and the herring, which, as food, fertilizer, and oil, brought \$155,579. The products of the whale fishery were valued at \$381,750. The whale fishery was conducted from two shore stations, which handled 470 whales of four species.

#### ENFORCEMENT OF LAW.

Congress has shown a disposition to provide adequate facilities for enforcing the fishing laws along the extensive Alaskan littoral, but the need for more men and boats is great, and satisfactory results can not be accomplished until the need is met. The available vessel service in 1915 was supplemented by the charter of power boats during the active fishing season, and the patrol covered upward of 10,000 miles of coast.

It is a pleasure to be able to state that the fishery laws are now more generally observed in both spirit and letter than was the case a few years ago, and comparatively few violations were reported in 1915. These are noted in full in the special report on "Alaska fisheries and fur industries in 1915," which forms an appendix to the report of the Commissioner of Fisheries for that year. Some convictions have been secured, some defendants have been discharged, and some indictments are still pending. In one case, involving fishing during the Sunday close time, the defendant pleaded guilty and the jury found him not guilty.

#### WATERS CLOSED TO COMMERCIAL FISHING.

On October 1, 1915, a hearing was held in Seattle to give all persons interested an opportunity to present their views on the desirability of closing to commercial fishing certain waters in southeast Alaska to be preserved for natural salmon breeding. The hearing confirmed the view that the waters should be closed, and, accordingly, on the recommendation of the Bureau, the Secretary issued an order, dated October 25, 1915, and effective January 1, 1916, prohibiting all fishing for salmon or for other fishes if salmon are taken or injured thereby in the following waters:

1. All waters tributary to Barnes Lake, Prince of Wales Island.
2. Hetta Creek, its tributary waters, and the region within 500 yards of the mouth of said creek.

3. Sockeye Creek, its tributary Boca de Quadra hatchery waters, and the region within 500 yards of the mouth of said creek.

#### COMMERCIAL FISHING WITHIN RESERVATIONS.

Permits have been issued by the Department, on the recommendation of the Bureau, to conduct certain fishing operations within the limits of the Aleutian Islands Reservation, established by executive order of March 3, 1913. In January, 1916, the company known as the Pacific-American Fisheries was authorized to construct and operate on Unalaska Island a plant for canning or salting salmon or other food fishes. This is the first permit of this character granted, as former permits have covered only minor fishing. The matter of granting a permit for a cannery within the reservation came about as the result of a petition signed by 109 natives of Unalaska Island, who set forth that the construction of a cannery on Unalaska Island would afford them a most advantageous means of employment and at the same time the operations of the cannery would not make such a heavy demand upon the runs of salmon that there would not be enough left for the food requirements of the natives. The permit was granted under the condition that all work except that requiring skilled mechanics and operators in connection with the taking of fish and their subsequent preparation for market should be performed by the Aleuts or Indians resident upon the said reservation. Other conditions were that the weekly close season should be observed, that fishing would not be conducted with fixed appliances, and that no fishing would be carried on within any salmon stream or within 100 yards outside of the mouth of any such stream. Failure to observe the stipulations of the permit will automatically result in its termination. The permit is not transferable and is revocable at any time at the pleasure of the Secretary of Commerce.

In January, 1916, a private individual of Unalaska was authorized to conduct certain specified fishing within the reservation, with a stipulation as to the employment of native help. In June, 1916, the Union Fish Co., of San Francisco, was granted permission to engage in cod-fishing operations from Tigalda Island.

On the Afognak Reservation 79 licenses were issued to natives to take salmon for commercial purposes under restrictions imposed by the Department. The catch, which was disposed of to a cannery located outside the reservation, comprised 134,692 salmon of the red, coho, and humpback species and yielded the natives about \$4,500.

By the terms of a presidential proclamation issued April 28, 1916, the waters within 3,000 feet of Annette Island and several small adjacent islands in southeast Alaska were set apart as a fishing reserve for the exclusive benefit of Alaskan natives living thereon, to be used by them under the fishery laws and regulations of the Territory as administered by the Department of Commerce.

#### SALMON CENSUS IN WOOD RIVER.

The Wood River has been closed to fishing for many years and is resorted to for breeding purposes by red salmon escaping the nets in Nushagak Bay. The counting of the salmon was first undertaken in 1908 and has been continued annually since that time except in 1914.

The counting is made possible by throwing a rack across the stream and compelling the fish to pass through a narrow gate where they are easily visible to persons immediately above. Agents of the Bureau in relays are kept on duty day and night for the entire period of the run, and the tally is kept by an automatic counting device manipulated by hand. In 1915 the counting began on June 14, when 161 fish passed, and continued till August 2, when the run had dwindled to 70. The maximum was reached in the seven days from July 7 to 13, 26,901 fish being observed on July 7 and 25,554 on July 12. The total count was 259,341 redfish.

It was noted that many of the fish bore scars, abrasions, and mutilations produced by gill nets from which they had managed to escape. The number of netted fish usually ranged from 12 to 26 per hundred and sometimes from 30 to 42 per hundred, averaging about 18 per cent of those specially enumerated. On the other hand, in one count of 1,103 fish there were only 2 injured. It is estimated that fully 90 per cent of the fish that liberated themselves from the gill nets died before spawning as a result of the injuries received.

As on previous occasions, the Bureau was rendered invaluable assistance in conducting this interesting work by the Alaska Packers Association and the Alaska-Portland Packers Association.

#### INSPECTION OF HATCHERIES.

The five private salmon hatcheries operated in Alaska in 1915 were inspected from time to time by agents of the Bureau. Cognizance was taken of the number of eggs received and hatched, the number of fry planted, and the hatchery records and methods.

The output of these plants in the fiscal year ending June 30, 1916, was 79,619,500 red-salmon fry. Under the law the operators were entitled to a tax rebate of 40 cents for every thousand fry hatched and liberated; and affidavits having been made in the manner prescribed by law, the operators became entitled to receive rebate certificates aggregating \$31,847.80, which amount is applied to the tax of 4 cents per case on canned salmon.

In June, 1916, a communication was received from the Alaska Packers Association announcing that, in view of certain unfavorable conditions at the hatchery belonging to that company at Karluk, it had been decided to close the plant at the end of the fiscal year 1916 or as soon as the fry then on hand could be liberated. This is the oldest hatchery in Alaska, having been built in 1896. During the period of its operation, which was continuous, it has handled over 627,000,000 red-salmon eggs.

#### ALASKA FISHERY LEGISLATION.

The necessity for revising the present fishery laws of Alaska has been appreciated for some years. The matter took definite shape in January, 1916, when Hon. J. W. Alexander, of Missouri, introduced in the House of Representatives a bill for the protection, regulation, and conservation of the fisheries of Alaska. The bill was referred to the Committee on the Merchant Marine and Fisheries, of which he was chairman, and numerous hearings thereon were held during the latter part of the fiscal year. The bill has the approval of the Department, was prepared after protracted conferences with repre-

sentatives of the fishing industry, and is designed to meet the new conditions that have arisen since the law of June 26, 1906, was passed. It is believed that the essential features of the bill, if enacted into law, will insure the perpetuation of the Alaskan fisheries at their maximum productivity and will yield to Federal and Territorial Governments a handsome revenue. Up to the close of the fiscal year the measure had not been acted on by the committee, but this was subsequently done, and a favorable report was ordered on a revised bill introduced by Mr. Alexander on August 18.

The halibut fishery, which ranks next to the salmon industry in importance and is capable of still further expansion, is reported to be injuriously affected as an Alaskan industry by the unusual course followed by the Canadian Government for the promotion of the interests of the Grand Trunk Pacific Railroad and its western terminus, Prince Rupert. The matter has had the attention of the Department of Commerce, in cooperation with other executive departments, and the decision has been reached that legislative action is required to prevent the diversion of the Alaskan halibut fishery, whose output goes only to the American market, from Alaska to British Columbia. The Bureau has, therefore, approved a measure, introduced in Congress, which is intended to meet the peculiar geographic and economic conditions surrounding the fishery. Under the terms of the proposed bill, fresh halibut (and salmon) from the Pacific Ocean and its tributaries coming into the United States through a foreign country must be shipped in bond from an American port.

On June 3, 1916, the Senate passed a bill for the protection and conservation of the halibut fishery of the Pacific Ocean, which includes the establishment of a close season for halibut fishing in certain waters and places restrictions on the landing of halibut during that time. The chief feature of the bill is the fixing of a close season during the months of December and January, when all fishing for halibut in any of the waters of the Pacific Ocean or its tributaries over which the United States has jurisdiction is prohibited. The bill also provides for a reserved area off the coast of southeast Alaska, in which fishing for halibut is prohibited at all times. This area is defined definitely in the bill, but, briefly, it may be described as a rectangular area of water about 19 miles long and averaging 15 miles in width extending offshore between Cape Lynch and Cape Addington. Its area is approximately 290 square nautical miles. The bill provides that it shall take effect as soon as possible after the enactment of concurrent or essentially similar regulations by Canada, and that if at any time after due investigation it is the opinion of the Secretary of Commerce that the regulations adopted by Canada are inadequate either as to their provisions or enforcement he is authorized and directed to suspend the operations of the act until such time as he may be satisfied that such provisions and their enforcement have been made adequate for the protection of the halibut fishery. Violations of the measure are punishable by a fine not exceeding \$1,000 or by imprisonment for not more than 90 days. Vessels and their catch may be seized and held subject to the payment of fines. This bill embodies the Bureau's views, and its passage will, it is believed, meet with general favor alike with the American and Canadian halibut fishing interests, which have advocated most of the principles set forth in the bill.



## ALASKA FUR-SEAL SERVICE.

## SEAL HERD.

The fur seals resorting to the Pribilof Islands, having enjoyed continued immunity from indiscriminate killing at sea through the operation of an international agreement, have increased in a manner that has justified optimistic predictions.

The regular census of the herd taken in 1915, under the direction of G. Dallas Hanna, showed a noteworthy increase over 1914. The actual number of pups born was 103,527, as compared with 93,250 in 1914, 92,269 in 1913, and 81,984 in 1912. The total number of seals computed to be in the herd was 363,872, as compared with 294,687 in 1914, 268,305 in 1913, and 215,738 in 1912. The classes of seals which are susceptible of actual enumeration are pups, harem bulls, and idle bulls. The number of breeding cows, since each gives birth to but one pup a season, is, of course, equal to the number of pups. The numbers of animals in the remaining classes must be obtained from estimates of death rates, fortified by incomplete counts, etc. In 1915, in view of the increased knowledge of the herd, the enumerator felt it desirable to change the percentages heretofore used in estimating the losses for the first three years of the seal's life. This makes the total of the number of seals determined to be in the herd of 1915 not exactly comparable with the totals of previous censuses. The details of the 1915 count are as follows:

Pups.....	103, 527	3-year-old males.....	18, 282
Breeding cows.....	103, 527	4-year-old males.....	15, 848
Harem bulls.....	2, 151	5-year-old males.....	11, 271
Idle bulls.....	673		
Yearlings.....	60, 613	Total.....	363, 872
2-year-olds.....	47, 980		

In 1912, 5,228 pups of the season were branded on the Pribilof Islands. Subsequent observations made on these branded animals have been productive of valuable additional knowledge in regard to the natural history and growth of the seals. Some of these animals were observed in 1913, and in 1914 they were noted in large numbers. The number which returned in 1915 was so large, in comparison with the total number of seals under observation, as to indicate a lower mortality in the first three years of the seal's life than had ordinarily been assumed. In 1915, from January 1 to August 10, inclusive, 53 of these branded seals were killed on St. Paul Island and 49 on St. George Island, the skins of which were shipped to St. Louis that year. One hundred of these were graded in accordance with the London trade classification, with the following result:

Small pups.....	7
Middling pups.....	42
Large pups.....	42
Smalls.....	8
Middling and smalls.....	1
Total.....	100

At the same time the skins of 15 of 18 branded seals killed in 1914, and therefore 2 years old, were graded as follows, the remaining 3 not being accessible at the time:

Extra small pups.....	3
Small pups.....	8
Middling pups.....	4

The census for 1916, taken under the same conditions as in 1915 and with the same basis for computing the various elements of the herd, gave a total of 417,329, as follows:

Pups.....	116, 977	Yearlings, both sexes.....	67, 291
Breeding cows.....	116, 977	2-year-olds, both sexes.....	48, 460
Harem bulls.....	3, 500	Bachelors and young bulls.....	61, 492
Idle bulls.....	2, 632		

These figures indicate a large surplus of male seals, as was to have been expected from the operation of the existing close-time law, which restricts the killing of seals to the limited needs of the natives. The conditions, biological and economic, arising from the presence of large numbers of mature and adolescent males far beyond the requirements of the herd, demand the serious attention of the Department and of Congress, and the conditions will be much more acute by the expiration of the close-time law in August, 1917.

#### SEALS TAKEN FOR NATIVES' FOOD.

The killing of seals on the Pribilof Islands has been limited to that number necessary for the food purposes of the natives. In the calendar year 1915 the quota of surplus male seals that could be taken was fixed at 5,500. The number actually taken was 2,666 on St. Paul and 1,281 on St. George, a total of 3,947. For 1916 the maximum number that could be taken was fixed at 7,500. Improved facilities for caring for seal meat make it possible for the natives to properly utilize a larger number of seals than formerly, and a saving will, therefore, be effected in the amount of meats that would otherwise have to be sent from the States.

The sealskins shipped from the islands in 1915 numbered 3,000, which were consigned to St. Louis for sale. No skins were disposed of during the past fiscal year. The condition of the market did not warrant the offering of the skins on hand resulting from the food killings for natives in 1914 and previously, and trade considerations made it desirable to postpone beyond the fiscal year 1916 the marketing of those pelts and the additional ones shipped to St. Louis in the fall of 1915. Congress passed a joint resolution, approved June 22, 1916, giving to the Secretary of Commerce authority to dispose of sealskins in such market, at such times, and in such manner as he may deem most advantageous, and the sale was, accordingly, postponed until the fall of 1916.

#### ESTABLISHMENT OF THE FUR-SEAL TRADE IN AMERICA.

The announced purpose of the Department to market its Alaskan fur-seal and other skins in America, instead of sending them abroad as heretofore, was given definite form in 1915 by the making of a contract with Messrs. Funsten Bros. & Co., of St. Louis, under which the sale of fur-seal and fox skins belonging to the Government will for a term of years take place at public auction in St. Louis. In connection with this contract, the Department has been instrumental in securing the establishment in St. Louis, through Messrs. Funsten Bros. & Co., of a plant for the dressing and dyeing of sealskins in accordance with the most approved methods known to the trade, and arrangements have been made under which all or part of the

take of Alaskan fur-seal skins may be dressed and dyed before being offered for sale. The actual treatment of fur-seal skins for this purpose was begun in St. Louis in December, 1915, and the results obtained indicate that the work will be highly successful. A limited offering of such skins was made at the public auction held in St. Louis in September, 1916, and the Department has reason to be pleased with the outcome. The interests of the trade and the Government are favored by the offering of dressed instead of raw skins, and general satisfaction has been expressed over this important innovation.

#### SUPPORT OF THE NATIVES.

The native inhabitants of the Pribilof Islands on June 30, 1915, numbered 314, of whom 193 were on St. Paul and 121 on St. George. The population remains fairly uniform from year to year.

The physical condition of these people is excellent, all things considered. Improved sanitary measures have been enforced, and the promiscuous making and use of intoxicating liquors, once prevalent and sanctioned by the Government, has been entirely suppressed. Congress has recently provided new housing facilities, which, with additional improvements that are contemplated, will conduce still further to the comfort, contentment, and advancement of the natives.

The teaching staff on the islands has performed efficient service, and the native schools are in a satisfactory condition. Stress is being laid on manual training and on the use of the English language instead of Aleut or Russian.

Owing to the delay in making the steamer *Roosevelt* available for carrying supplies to the islands other arrangements had to be made, a navy collier being availed of in the fall of 1915 and a private vessel in the summer of 1916. The very satisfactory and economical method of purchasing supplies, as mentioned in last year's report, has been followed.

In 1911 small numbers of reindeer were placed on both St. Paul and St. George Islands to serve as a nucleus for herds which would contribute materially to the support and welfare of the natives. The herds have thrived and have shown satisfactory increases from year to year. In 1915 the number of fawns born was 45 and the total number of all ages was 154. The natives, however, have not thus far shown the interest in the reindeer that was hoped for, and it will probably be necessary for the Bureau's officers on the islands to direct most of the activities in respect to these herds for a number of years to come. Early in 1916 comprehensive plans were prepared in connection with this work. These plans, in addition to the management of the herd itself, contemplate that the inhabitants of the islands shall be trained to make economic use of the skins, horns, and other parts by manufacturing them into articles of clothing and household furnishings for local use and perhaps export for sale for the natives' benefit.

#### BLUE FOXES.

The herds of blue foxes which inhabit the Pribilof Islands continue productive of revenue to the natives and the Government. The taking of foxes in the season of 1915-16 was begun in November on

St. George Island and early in December on St. Paul Island. The take for the season consisted of 211 blue-fox pelts and 18 white-fox pelts on St. Paul Island and 209 blues and 2 whites on St. George Island, a total for both islands of 420 blues and 20 whites. These skins were consigned to Messrs. Funsten Bros. & Co., St. Louis, for sale in September, 1916. In the calendar year 1915 there were shipped from the Pribilof Islands 253 blue-fox skins and 40 white-fox skins. These skins represented the take for the 1914-15 season and, together with 256 blue-fox skins and 25 white-fox skins shipped from the islands in 1914, were sold at public auction on October 21, 1915. The net proceeds of this sale amounted to over \$56,000. The sale was very successful and many pelts brought unusually good prices. Five lots consisting of four blues each brought \$1,092, \$1,020, \$1,012, \$1,000, and \$980, respectively. The white-fox pelts brought from \$17 to \$30 per pelt.

The number of foxes that the island will support under existing conditions is limited, and the trapping of a certain number each season, under the strict supervision of the agents, is beneficial to the herd. The natives are credited with supplies valued at \$5 for each fox skin taken.

#### COAST-GUARD PATROL AND THE NAVAL RADIO SERVICE.

The usual efficient patrol of the North Pacific Ocean and Bering Sea was maintained by the Coast Guard Service in the seasons of 1915 and 1916 for the purpose of preventing pelagic sealing. The vessels of this patrol rendered invaluable assistance in carrying persons, mails, and supplies, to and from the Pribilof Islands. The agent on St. Paul Island in 1915 reported some evidences of illegal seal hunting, but no proof of such operations could be obtained.

The North Pacific Sealing Convention of July 7, 1911, and the act of Congress giving effect to that convention, approved August 24, 1912, permit certain Indians, Aleuts, or other aborigines dwelling on the Pacific coast of America north of latitude 30° to kill seals under certain restricted conditions. As far as is known, no seals were taken in accordance with these provisions in 1915. In 1916 several hundred skins were taken by Indians of the State of Washington, but complete details in regard to these skins are not yet available. By far the larger proportion of the seals so killed are females.

The Department is under obligations to the Navy Department for the continuous service which the latter has rendered in connection with the two radio stations on the islands. These stations make it possible to keep in prompt touch with conditions on the islands at all times of the year and permit the agents to send full reports of conditions and needs. Formerly the islands were cut off from communication with the entire world through the long winter season, when navigation in Bering Sea is closed.

#### MINOR FUR-BEARING ANIMALS OF ALASKA.

The laws and regulations for the protection of the minor fur-bearing animals of Alaska have been enforced by a corps of wardens, who have been constantly in the field, supplemented by members of the Alaska fishery service at such times as their regular duties would

permit. In October, 1915, Reginald F. Irwin, a warden, while engaged in patrol work in southeast Alaska, lost his life. Accompanied by two men in a hired boat he left Ketchikan on October 9, and several days later his wrecked boat was discovered in the Chickamin River. Prolonged and systematic search was at once instituted, but no trace of Mr. Irwin and his companions was found and no explanation of the disaster has been possible.

Under date of May 24, 1915, revised regulations for the protection of fur-bearing animals in Alaska were issued in Department Circular No. 246, third edition. These have proved generally satisfactory. No special restrictions are put upon the shipping of live fur-bearing animals from Alaska or upon the taking of live animals at any time for use for breeding purposes. The law does not clearly authorize the Department to make the necessary regulations restricting the shipping of live animals from the Territory; and owing, apparently, to the decreased outside demand for fur-bearing animals for use for breeding purposes, particularly foxes, but few were shipped from Alaska in the calendar year 1915. This cessation of demand for live Alaska fur bearers may be only temporary, and it is very important that the Department have authority to make proper regulations in regard to the exportation of these animals. It is felt that legitimate fur farmers should be permitted to secure breeding animals from wild stock in the close season, at least until breeding stock may be obtained from other farms. The inability to regulate this matter results in abuses which meet with disapproval throughout Alaska.

The marked decrease in the abundance of martens has necessitated further measures for their protection. The Department has, therefore, issued a regulation, effective March 15, 1916, making the killing of this valuable animal illegal until November 15, 1921. This regulation has met with general approval from persons familiar with the facts. It is covered in Department Circular No. 246, fourth edition, issued under date of February 1, 1916.

The value of the furs shipped from Alaska in the year ended November 15, 1915, exclusive of Pribilof Islands skins, aggregated \$400,532. All shipments are required to be reported to the Bureau, and the returns are believed to be quite complete, owing to the effective cooperation given by postmasters, agents of commercial companies, and individual shippers.

In the fiscal year 1916 no additional islands were leased for the breeding of fur-bearing animals. The islands now under lease are Carlson, Middleton, Simeonof, and Little Koniui. Shortly after the close of the fiscal year there was accepted an offer for the leasing of Marmot Island, near Afognak, for a period of five years at an annual rental of \$200.

It is regretted that Congress has not yet taken action to relieve the Bureau of custody over the terrestrial fur bearers of Alaska. A bill to accomplish this purpose was introduced in the House on January 29, 1916, and referred to the Committee on Territories. No hearings have been held thereon, but it is strongly urged that prompt steps be taken to terminate the existing arrangement.

## MISCELLANEOUS MATTERS.

## NEW ESTABLISHMENTS AND CONSTRUCTIONS.

The site for the fish-cultural station in Utah authorized in 1914 was selected near Springville, and title to 24.3 acres of land was acquired by deed dated August 24, 1915, together with rights to 15 second-feet of water so disposed as to furnish a gravity supply. Springville is in Utah County on the Denver & Rio Grande Railroad, and the property immediately adjoins the town, being about 1 mile distant from the business center. Water is obtained from springs which flow about 5,000 gallons per minute. A topographical survey of the property has been made; plans of buildings, water supply, and drainage systems have been prepared; and construction work has been begun. The hatchery is a one-story frame structure, built on a cement foundation, and contains hatching room, office, storeroom, boiler room, etc., on the first floor and two bedrooms and workroom in the attic. The building is 32 by 95 feet and is intended to accommodate 120 troughs.

The site selected for the marine biological station on the Gulf coast of Florida was acquired by a deed dated July 10, 1915. It is about 3 miles distant from the city of Key West at the extreme eastern end of the island. The act authorizing the establishment of this station required that the land be donated, and the Key West Realty Co., from which the property was obtained, not only donated 4 acres of land, but, without cost to the Government, constructed a sea wall along the water front of the property and excavated a channel 30 feet wide and 6 feet deep from near Cow Key to the selected site. The full amount authorized in the original act, namely, \$50,000, has now been provided, and the preparation of plans and specifications for the laboratory building is under way.

The hatchery authorized for Rhode Island will be located on Block Island and will be devoted to the commercial species of that region. The site has been selected and surveyed, but title to the property has not yet been secured.

The special appropriation of \$10,000 for the Orangeburg, S. C., station has been used chiefly in making improvements to the water supply and drainage systems and in constructing six brood ponds and six concrete rearing ponds.

The appropriation of \$20,000 for the completion of the Louisville, Ky., station has been expended in part in improving the extensive grounds, providing a fish-culturist's cottage, and constructing 20 concrete retaining tanks under cover.

With the sum of \$18,000 provided for the Saratoga, Wyo., station, in addition to the amount previously provided, there have been completed the hatchery, superintendent's residence, fish-culturist's cottage, tool house, ice house, one stock pond, six concrete rearing ponds, and concrete distributing cistern and reservoir. A hydraulic ram has been installed and the main water-supply pipe lines have been laid. The hatchery building is 32 by 64 feet and accommodates 36 troughs.

An additional tract of land containing  $6\frac{1}{2}$  acres, adjoining the Cold Spring, Ga., station, was acquired by deed dated July 24, 1915, for the sum of \$5,000. The property includes a dwelling, which has been repaired and is utilized to good advantage, and the possession of this

land enables the Bureau to protect the water supply and construct additional ponds.

At the Clackamas, Oreg., station, a one-story six-room frame building, with attic and cellar, has been completed as a superintendent's residence.

The special appropriation of \$4,500 for reconstruction of the hatchery building and barn at the Baker Lake, Wash., station, which were destroyed by fire, has been expended in accordance with the terms of the appropriation. Substantial new buildings constructed by the station force were completed early in the summer of 1915 and were ready for the salmon operations that year.

It is a pleasure to record the donation of a fish hatchery by a private individual. Mary A. Scully, widow of John S. Scully, has transferred to the Government the property known as the Berkshire Trout Hatchery, in the Berkshire Hills, Mass., comprising about 135 acres of land, with buildings, ponds, etc. The hatchery was run for a number of years by Mr. Scully, and Mrs. Scully's object in making this noteworthy bequest was to insure the perpetual maintenance of the property for the purpose to which her husband had dedicated it. The acceptance of the gift was authorized by joint resolution of Congress approved July 28, and the property has now passed into the custody of the Bureau of Fisheries. The necessary permanent personnel has been provided for in the 1918 estimates submitted to Congress.

#### MOVEMENTS, REPAIR, AND CONSTRUCTION OF VESSELS.

The special fishery and other work with which certain vessels have been connected has been noted elsewhere. There may be given under this head some data that pertain more particularly to the mere movements and the repairs of some of the seagoing craft.

On July 1, 1915, the *Albatross* was being prepared to take up again the halibut investigations off the coasts of Washington and Oregon, and on July 6 the vessel sailed from Sausalito, Cal., arriving off the mouth of the Columbia River July 9. The work was continued until September 9, and the ship then proceeded to San Francisco, arriving two days later. Until October 11 she was anchored off Sausalito and was then taken to docks at Alameda. From that time until March 7, 1916, the crew was kept busy overhauling the ship and machinery, repainting, etc. The vessel was docked on March 7. This long period of inactivity was owing to lack of funds sufficient for cruising expenses. The deficiency act approved February 28, 1916, appropriated \$7,500 for maintenance of vessels for the Bureau, and with this sum an investigation of the tuna fisheries off the coasts of southern and lower California was undertaken, an investigation which had been in contemplation for a number of years. The cruise was begun April 4, and the work was in progress at the close of the fiscal year. During the year the *Albatross* cruised some six months, covering 9,850 miles and consuming 950 tons of coal. On July 1, 1915, Lieut. L. B. Porterfield, U. S. Navy, was detached from the command of the vessel and was succeeded on the same day by Lieut. Commander J. J. Hannigan, U. S. Navy.

During the early part of the summer of 1915 the steamer *Fish Hawk* was utilized in connection with the Beaufort laboratory and on August 10 was assigned to special investigations in Long Island Sound, with which she was occupied until October 7. On October 21 the biolog-

ical and physical investigation of the waters of Chesapeake Bay was undertaken and arrangements were made for periodical trips, five of which were made prior to July 1. Between March 21 and April 15, 1916, the vessel was used in experimental shad hatching on the Cape Fear River. Some minor repairs were made at the Norfolk Navy Yard during November and December, 1915. During the year the vessel cruised 5,811 miles and consumed 703 tons of coal. On September 6, 1915, Boatswain James J. O'Brien, U. S. Navy, was succeeded in command by Chief Boatswain James Mahoney, U. S. Navy.

The *Phalarope* has been attached to the Woods Hole station, as heretofore, and has rendered service in both fish-cultural and biological work at that place. When the shad-hatching season began on the Potomac River in the spring of 1916, the vessel was detailed to that field.

The *Curlew* has been employed on the Mississippi River, in connection with the rescue of fishes from the overflowed lands and with the operations of the Fairport laboratory.

The steamer *Osprey* has been employed in southeast Alaska on fishery-patrol work.

The auxiliary schooner *Grampus*, having headquarters at Gloucester, Mass., was used in oceanographic and herring investigations in the Gulf of Maine from July 1 to October 27, 1915. From November to May the vessel was laid up and her crew was assigned to fish-cultural work at the Gloucester hatchery. From May 9 to June 30 the vessel was at Gloucester, with the crew engaged in scraping, painting, overhauling rigging, and general cleaning, in preparation for cruising after the new fiscal year began.

The alterations originally contemplated on the steamer *Roosevelt* proceeded satisfactorily and were completed at the Norfolk Navy Yard. The vessel was inspected by a board, of which the superintendent of naval construction, Bureau of Lighthouses, was the senior member, and on April 5 this board advised certain additional work before the ship was sent to sea. This was authorized as soon as funds permitted, and all was practically completed in August, 1916, except for the installation of a new tail shaft, a forging for which was difficult to obtain owing to the excessive demands on the steel mills for material. The *Roosevelt* has cost the Government somewhat over \$72,000. The original cost of this vessel was about \$150,000, and it is estimated that it would have cost not less than \$100,000 to build a vessel of similar dimensions which would fill the Bureau's requirements.

A contract for the construction of a new vessel for use on the Maine coast, for which there was an appropriation of \$45,000, was awarded, in March, 1916, to the Townsend Marine Railway & Construction Co., of Boothbay Harbor, Me., for \$44,217. The vessel was designed for use not only in connection with the operations of the marine hatchery but for oceanographic and fishery investigations as well. She is a single-screw steam-propelled wooden vessel, 108 feet 6 inches over all, with 22 feet beam and 8 feet draft. She is equipped with a 320-horsepower engine and an Almy water-tube boiler, with a mast fitted for dredging. On the main deck are quarters for the officers and investigators, with laboratory and cabin. Below decks are the crew's quarters, water tanks, machinery, storerooms, etc., and an arrangement for transporting live fishes. It is expected the vessel will be completed during the coming winter.



## PUBLICATIONS.

During the fiscal year the following publications were issued and distributed, chiefly through the Superintendent of Documents, on special mailing lists:

## REPORT OF THE COMMISSIONER AND APPENDICES THERETO.

Report of the Commissioner of Fisheries to the Secretary of Commerce for the fiscal year ended June 30, 1915. 83 p.

Alaska fisheries and fur industries in 1914. By Ward T. Bower and Henry D. Aller. Appendix IX to Report of Commissioner for 1914. 89 p.

The distribution of fish and fish eggs during the fiscal year 1915. Appendix I to Report of Commissioner for 1915. 138 p.

Fish ponds on farms. By Robert S. Johnson and M. F. Stapleton. Appendix II to Report of Commissioner for 1915. 28 p., 18 pl.

## BULLETIN OF THE BUREAU OF FISHERIES.

An ecological reconnaissance of the fishes of Douglas Lake, Cheboygan County, Mich., in midsummer. By Jacob Reighard. Bulletin, vol. xxxiii, 1913, p. 215-250, 4 text fig. 1915.

The Potamogetons in relation to pond culture. By Emmeline Moore. Bulletin, vol. xxxiii, 1913, p. 251-292, pl. xxii-xxxix.

Changes in shade, color, and patterns in fishes, and their bearing on the problems of adaptation and behavior, with especial reference to the flounders *Paralichthys* and *Ancylosetta*. By S. O. Mast. Bulletin, vol. xxxiv, 1914, p. 173-238, pl. xix-xxxvii, 3 text fig.

The sharks and rays of Beaufort, N. C. By Lewis Radcliffe. Bulletin, vol. xxxiv, 1914, p. 239-284, pl. xxxviii-xlix, 26 text fig.

Copepod parasites of fresh-water fishes and their economic relations to mussel glochidia. By Charles Branch Wilson. Bulletin, vol. xxxiv, 1914, p. 331-374, pl. lx-lxxiv.

The fishes of the streams tributary to Tomales Bay, Cal. By John Otterbein Snyder. Bulletin, vol. xxxiv, 1914, p. 375-382, 1 text fig.

The Fairport fisheries biological station: Its equipment, organization, and functions. By Robert E. Coker. Bulletin, vol. xxxiv, 1914, p. 383-406, 6 text fig., pl. lxxv-lxxxvi.

Notes on the embryology and larval development of five species of teleostean fishes. By Albert Kuntz. Bulletin, vol. xxxiv, p. 407-429, 68 text fig.

## SPECIAL PUBLICATIONS.

The Bureau of Fisheries and its station at Woods Hole, Mass. 11 p., illus.

The Bureau of Fisheries and its biological station at Beaufort, N. C. 11 p., illus.

## ECONOMIC CIRCULARS.

Fishes destructive to the eggs and larvae of mosquitoes. 19 p., 28 text fig.

Oysters: The food that has not "gone up". A little of their history and how to cook them. 16 p.

The tilefish: A new deep-sea food fish. 6 p., 2 text fig.

Caviar: What it is and how to prepare it. 8 p., 3 text fig.

Information concerning parasitic worms in fish. 4 p.

## STATISTICAL BULLETINS.

Monthly and annual statements of the quantities and values of certain fishery products landed by American fishing vessels at the ports of Gloucester and Boston, Mass., Portland, Me., and Seattle, Wash.

Crab industry of Maryland and Virginia in 1915.

Fresh-water mussel fishery of the Mississippi River and its western tributaries from Kansas northward in 1914.

Coastal fisheries of New York and New Jersey, exclusive of shellfish, in 1915, with shad fishery of the Hudson River in 1915 and 1916.

Shad and alewife industry of Chesapeake Bay and tributaries in 1915.

The Fisheries Service Bulletin has proved of great interest throughout the Bureau and also to State fishery authorities, technical publications, etc. In order to meet the demand the monthly editions have had to be enlarged from time to time, and the number of pages has been increased from four to eight.

#### APPROPRIATIONS.

The appropriations for the Bureau of Fisheries for the fiscal year 1916 aggregated \$1,075,340, as follows:

Salaries.....	\$393, 840
Miscellaneous expenses:	
Administration.....	10, 000
Propagation of food fishes.....	350, 000
Maintenance of vessels.....	60, 000
Inquiry respecting food fishes.....	40, 000
Statistical inquiry.....	7, 500
Protecting sponge fisheries.....	2, 500
Protecting seal and salmon fisheries of Alaska.....	75, 000
Pay of crew of vessel, Alaska service.....	16, 000
Purchase or construction of vessels for Boothbay Harbor station.....	45, 000
Purchase or construction of a steel distribution car.....	20, 000
Cold-storage plant fur-seal islands.....	3, 000
Completion of and improvements at fish-cultural stations:	
Orangeburg, S. C.....	10, 000
Louisville, Ky.....	20, 000
Saratoga, Wyo.....	18, 000
Baker Lake, Wash.....	4, 500

Respectfully,

H. M. SMITH,  
*Commissioner.*

To Hon. WILLIAM C. REDFIELD,  
*Secretary of Commerce.*

# THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1916

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HENRY O'MALLEY

*Assistant in Charge of Fish Culture*

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Appendix I to the Report of the U. S. Commissioner of Fisheries for 1916

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## THE DISTRIBUTION OF FISH AND FISH EGGS DURING THE FISCAL YEAR 1916.

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### CHARACTER OF WORK.

The fish-cultural operations of the Bureau of Fisheries are directed to the restoration and maintenance of the commercial fisheries of the country and to the development and extension of the fish-producing area of its interior waters. The needs of the great fisheries industries, which embrace large investments of capital and contribute important food supplies of salmon, shad, codfish, lobster, etc., are paramount. The work of assembling and hatching the eggs of the commercial species and the liberating of the resulting fry in suitable waters has been unremittingly prosecuted by the Bureau, and there has been no relaxation of the efforts of past years to discover and develop new fields. A glance at the appended tabulation will disclose the magnitude of the distributions and the wide extent of territory covered. With an output of the size indicated it may readily be understood that it is necessary to liberate the greater portion of the fish during the very early stages of their existence.

The fishes furnished for the stocking of the streams, lakes, and ponds of the interior during the fiscal year 1916 were largely of the fingerling sizes. Of trout, grayling, and salmon it has been possible to produce requisite numbers with facility, but the species applicable to the needs of a considerable portion of the country—the so-called warm-water fishes—are in a different category, and the Bureau has been unable to supply them in numbers sufficient to meet the rapidly growing demands. The eggs of fishes of this class, owing to adhesiveness or other deterrent qualities, are not adapted to hatchery processes and resultant multiplication on a large scale. Their production is therefore limited to such numbers as the brood fishes themselves are able to bring off their nests in ponds where partial protection is afforded, and while the output of the pond fish-cultural stations is annually expanding, it is far from being adequate to satisfy public requirements.

To make up for the deficiency so far as practicable, recourse is had to collections of the young of black bass and kindred species which abound in the temporary lagoons existing at times in the high-water zones of the Mississippi and Illinois Rivers.

Early in the year these rivers overflow their banks and spread out over miles of territory, and in the warm shallows thus formed many varieties of the native game and food fishes deposit their eggs. The young fish hatched therefrom are imprisoned in immense numbers, with the subsidence of the floods in the thousands of depressions ranging in depths from a few inches to several feet, and here they are preyed upon for several months by game birds and the alligator gar. Finally all that escape these enemies must perish incident to the drying of the pools in the fall. From depressions of this character the Bureau rescues many thousands of fish annually, returning by far the greater portion of them to the original streams, but culling out choice specimens to supplement its stock for distribution to applicants. This great resource is capable of being turned to highly successful account when funds are available for the extension of the rescue operations.

While only about 5 per cent of the Bureau's total output is applied to the interior waters of the country, the benefits accruing therefrom have been widely disseminated, and with the increasing cost of food materials this branch of the work is attaining greater significance. In its prosecution the Bureau has received valuable assistance from certain State fisheries authorities, club representatives, and public-spirited individuals, not only in formulating plans for but in the actual distributions of fish. One highly important and beneficial effect of such cooperation has been the development and growth of a sentiment opposed to the ruthless and destructive fishing methods in vogue in many localities.

#### METHOD OF DISTRIBUTION.

The fry hatched from the shad, whitefish, salmons, lake trout, lake herring, pike perch, white perch, yellow perch, striped bass, cod, lobster, pollock, flatfish, and haddock—constituting the commercial species—are planted on the spawning grounds from which the eggs are derived, or utilized for the stocking of new and suitable waters in an effort to extend the fisheries.

With respect to the game and food fishes of the interior, which are propagated in comparatively small numbers, provision is made for the return of a sufficient number of young fish to the waters where eggs are collected for the maintenance of the supply therein; the remainder of the stock is then assigned to suitable lakes or streams for which applications have been submitted by responsible individuals. This class includes the various trouts, basses, sunfishes, and catfishes.

Blanks upon which formal applications for fish can be made are furnished by the Bureau on request. Upon the receipt of applications

properly executed and bearing the indorsement of a United States Senator or Representative, an assignment of fish is made, suitable for the waters described and to the Bureau's facilities to supply, and the delivery is arranged for as soon as possible thereafter. Applicants should confine their choice of fish to species that are indigenous to the region of the waters to be stocked. Nonindigenous species of fish are assigned only upon the recommendation of the State fisheries authorities, and not then unless such recommendation conforms to the Bureau's judgment.

The Bureau refuses requests for such predaceous fishes as the black bass, sunfish, and kindred species for introduction into waters in California, Oregon, Washington, Idaho, Nevada, Wyoming, or western Montana, as it is believed their presence in such waters might prove harmful to the trout and salmon fisheries of that region.

Each species of fish spawns at a specific time during the year—the brook trout and the domesticated rainbow trout of eastern waters in the fall or early winter; the blackspotted trout, steelhead trout, and the wild rainbow trout of western waters during the spring; while all of the pond fishes reproduce in the spring or early summer.

The product of each season is distributed as the fish attain proper size for shipment, and after the exhaustion of the stock of one season no more are available until the same season the following year.

The distribution of trout in the Eastern States begins in March and is completed by the last of June, while trout shipments to applicants in the Middle States extend from about May 1 until well along in July. In the Rocky Mountain States the trout distributions occur somewhat later, the work usually starting by September 1 and continuing into the early winter.

The black basses produced at the Bureau's pond-cultural stations are distributed between May and August, while the miscellaneous fishes rescued from overflowed lands and the output of rock bass, crappie, sunfish, and catfish from these stations are shipped simultaneously, the distribution usually extending from August to December.

It is the policy of the Bureau to fill applications in the order of their receipt so far as practicable, but it is impossible to state definitely, in advance, when the fish requested by an applicant can be furnished, the approximate time of delivery depending upon transportation facilities, which are not always available on a given date, and, in the case of the pond or river fishes, upon the degree of success attained in the collections.

The number of fish assigned on an application must necessarily be governed by the available supply of the species requested and the time of year scheduled for the delivery, it being obvious that very young

fishes which have not been fed can be furnished in much larger numbers than those which have been held at considerable expense at the Bureau's stations until they have attained the size of fingerlings. It is the aim of the Bureau in all cases to allot a sufficient number of a given species to form a brood stock for the water area described, and those interested in the lake or stream so stocked are relied upon to see that the fish are afforded proper protection, by the restriction or prohibition of fishing, until a sufficient length of time has elapsed for them to reproduce, a period which will vary from two to three years, according to the species furnished.

Fry or very young fish can be shipped in much larger numbers than those of the fingerling sizes. A 10-gallon transportation can will safely carry from 2,000 to 3,000 fry of the trouts or black basses, from 500 to 1,000 one-inch fish of these species, and of those 2 inches long, from 100 to 300. It has been calculated that the varying numbers of the different sizes stated have practically equal value for stock purposes, as the losses in open waters from natural causes are in about the ratios indicated.

Some of the commercial species propagated—whitefish, pike perch, white perch, and shad, which are distributed only as fry—are so small that as many as 100,000 can be carried to a 10-gallon can.

Fish intended for applicants are carried to destination in specially-equipped railroad cars belonging to the Bureau, or in the regular baggage cars attached to passenger trains, an experienced messenger accompanying them for the purpose of aerating the water en route. The only expense the applicant is put to in connection with the transaction is that of transporting the fish from the railroad station designated in the application to the waters in which they are to be liberated. Some days in advance of an intended delivery the consignee is notified and given detailed instructions regarding the reception and care of the fish after they are turned over to him. He is notified again by wire a few hours before the arrival, in order that he may meet the train and receive the consignment, which will be handed to him from the car by the messenger.

During the fiscal year ended June 30, 1916, the Bureau received 12,487 applications from individuals and associations for fish to stock public and private waters. Requests for blanks upon which to submit applications for fish should be addressed to the Commissioner of Fisheries, Washington, D. C.



## SPECIES CULTIVATED.

During the fiscal year 1916 the Bureau handled some 50 species of fish, the fresh-water mussel, and the lobster. Of these the following were produced at its regular propagating stations:

## THE CATFISHES (SILURIDÆ):

Horned pout, bullhead, yellow cat (*Ameiurus nebulosus*).

Marbled cat (*Ameiurus nebulosus marmoratus*).

## THE SUCKERS AND BUFFALOFISHES (CATOSTOMIDÆ):

Smallmouth buffalofish (*Ictiobus bubalus*).

Common buffalofish (*Ictiobus cyprinella*).

Black buffalofish (*Ictiobus urus*).

## THE SHADS AND HERRINGS (CLUPEIDÆ):

Shad (*Alosa sapidissima*).

Glut herring, blueback (*Pomolobus æstivalis*).

## THE SALMONS, TROUTS, WHITEFISHES, ETC. (SALMONIDÆ):

Common whitefish (*Coregonus albus* and *C. clupeaformis*).

Lake herring, cisco (*Leucichthys artedii*).

Chinook salmon, king salmon, quinnat salmon (*Oncorhynchus tshawytscha*).

Silver salmon, coho (*Oncorhynchus kisutch*).

Blueback salmon, redfish, sockeye (*Oncorhynchus nerka*).

Humpback salmon (*Oncorhynchus gorbuscha*).

Dog salmon (*Oncorhynchus keta*).

Steelhead trout, hardhead (*Salmo gairdneri*).

Rainbow trout (*Salmo irideus*).

Atlantic salmon (*Salmo salar*).

Landlocked salmon (*Salmo sebago*).

Blackspotted trout: Yellowstone Lake trout or cutthroat trout (*Salmo lewisi*):

Tahoe trout (*Salmo henshawi*).

Scotch sea trout (*Salmo trutta*). Introduced species.

Loch Leven trout (*Salmo trutta levenensis*). Introduced species, propagated in limited numbers for observation.

Lake trout, Mackinaw trout, longe, togue (*Cristivomer namaycush*).

Brook trout, speckled trout (*Salvelinus fontinalis*).

## THE SMELTS (ARGENTINIDÆ):

American smelt (*Osmerus mordax*).

## THE GRAYLINGS (THYMALLIDÆ):

Montana grayling (*Thymallus montanus*).

## THE MACKERELS (SCOMBRIDÆ):

Common mackerel (*Scomber scombrus*).

## THE BUTTERFISHES (STROMATEIDÆ):

Butterfish, dollarfish, harvestfish (*Poronotus triacanthus*).

## THE BASSES, SUNFISHES, AND CRAPPIES (CENTRARCHIDÆ):

Crappie (*Pomoxis annularis*).

Strawberry bass, calico bass (*Pomoxis sparoides*).

Rock bass, red-eye, goggle-eye (*Ambloplites rupestris*).

Warmouth, goggle-eye (*Chanobryttus gulosus*).

Smallmouth black bass (*Micropterus dolomieu*).

Largemouth black bass (*Micropterus salmoides*).

Bluegill bream, bluegill sunfish (*Lepomis incisor*).

Other sunfishes, chiefly *Eupomotis gibbosus*.

## THE PERCHES (PERCIDÆ):

Pike perch, wall-eyed pike, yellow pike, blue pike (*Stizostedion vitreum*).  
 Yellow perch, ring perch (*Perca flavescens*).

## THE SEA BASSES (SERRANIDÆ):

Striped bass, rockfish (*Roccus lineatus*).  
 White perch (*Morone americana*).

## THE CODS (GADIDÆ):

Cod (*Gadus callarias*).  
 Haddock (*Melanogrammus æglifinus*).  
 Pollock (*Pollachius virens*).

## THE FLOUNDERS (PLEURONECTIDÆ):

Winter flounder, American flatfish (*Pseudopleuronectes americanus*).

## CRUSTACEANS:

American lobster (*Homarus americanus*).

The fishes rescued from overflowed lands in the Mississippi Basin and returned to the original streams were as follows:

## THE CATFISHES (SILURIDÆ):

Spotted cat, blue cat, channel cat (*Ictalurus punctatus*).  
 Horned pout, bullhead, yellow cat (*Ameiurus nebulosus*).

## THE SUCKERS AND BUFFALOFISHES (CATOSTOMIDÆ):

Smallmouth buffalofish (*Ictiobus bubalus*).  
 Common buffalofish (*Ictiobus cyprinella*).  
 Black buffalofish (*Ictiobus urus*).

## THE MINNOWS AND CARPS (CYPRINIDÆ):

Carp (*Cyprinus carpio*).

## THE PIKES AND PICKERELS (ESOCIDÆ):

Pike (*Esox lucius*).  
 Pickerel (*Esox reticulatus*).

## THE BASSES, SUNFISHES, AND CRAPPIES (CENTRARCHIDÆ):

Crappie (*Pomoxis annularis*).  
 Rock bass, red-eye, goggle-eye (*Ambloplites rupestris*).  
 Warmouth, goggle-eye (*Chænobryttus gulosus*).  
 Largemouth black bass (*Micropterus salmoides*).  
 Smallmouth black bass (*Micropterus dolomieu*).  
 Bluegill bream, bluegill sunfish (*Lepomis incisor*).  
 Other sunfishes, chiefly *Eupomotis gibbosus*.

## THE PERCHES (PERCIDÆ):

Yellow perch, ring perch (*Perca flavescens*).

## THE SEA BASSES (SERRANIDÆ):

White bass (*Roccus chrysops*).

## SUMMARIZED STATEMENT OF DISTRIBUTION.

The following table shows the number of fish and eggs actually distributed during the fiscal year 1916, or, in other words, the output of the hatcheries, with all losses in transportation deducted:

## SUMMARY, BY SPECIES, OF THE DISTRIBUTION OF FISH AND EGGS DURING THE FISCAL YEAR ENDED JUNE 30, 1916.

Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Catfish.....			2,545,777	2,545,777
Carp.....			4,336,832	4,336,832
Buffalo fish.....			563,815	563,815
Shad.....	1,097,000	77,644,545		78,741,545
Alewife.....		200,000		200,000
Whitefish.....	74,180,000	316,975,000		391,155,000
Lake herring.....		76,000,000		76,000,000
Silver salmon.....	198,500	8,684,334	1,469,507	10,352,341
Chinook salmon.....	20,622,340	57,250,714	22,982,655	100,855,709
Blueback salmon.....	3,000,000	57,964,920	32,442,748	93,407,668
Humpback salmon.....		19,179,124	3,144,584	22,323,708
Dog salmon.....		21,500,944	1,000,000	22,500,944
Steelhead trout.....	1,079,000	870,600	3,811,058	5,760,658
Rainbow trout.....	1,489,900	243,800	2,831,747	4,565,447
Atlantic salmon.....		1,709,815		1,709,815
Landlocked salmon.....	486,000	357,968	105,777	949,745
Scotch sea trout.....			509	509
Blackspotted trout.....	1,427,000	1,370,310	2,481,228	5,278,538
Loch Leven trout.....			105,500	105,500
Lake trout.....	7,328,054	36,414,323	278,100	44,018,477
Brook trout.....	635,000	5,057,650	7,576,817	13,269,467
Grayling.....	3,500,000	1,868,000		5,368,000
Smelt.....	36,000,000	15,000,000		51,000,000
Mackerel.....		1,946,000		1,946,000
Butterfish.....		392,000		392,000
Crappie.....			3,122,332	3,122,332
Rock bass.....			165,149	165,149
Smallmouth black bass.....		762,710	65,169	827,879
Largemouth black bass.....		471,300	1,357,768	1,829,068
Sunfish.....		33,000	1,635,881	1,668,881
Pike and pickerel.....			43,436	43,436
Pike perch.....	222,160,000	214,533,280		436,696,740
Yellow perch.....	27,500,000	195,491,000	183,111	223,174,111
Striped bass.....		10,071,000		10,071,000
White perch.....	25,000,000	97,350,000		122,350,000
White bass.....			4,950	4,950
Cod.....		318,681,000		318,681,000
Pollock.....		1,107,460,000		1,107,460,000
Haddock.....		22,170,000		22,170,000
Flatfish.....		1,532,947,000		1,532,947,000
Lobster.....		128,700,000	3,525	128,703,525
Total.....	425,700,794	4,339,300,337	92,261,435	4,847,262,566

## ALLOTMENTS OF FISH AND EGGS TO STATE FISH COMMISSIONS, FISCAL YEAR 1916.

State and species.	Eggs and fry. <sup>a</sup>	Finger- lings, yearlings, and adults.	State and species.	Eggs and fry. <sup>a</sup>	Finger- lings, yearlings, and adults.
Alabama: Black bass.....		1,000	Kentucky:		
California: Chinook sal- mon.....	19,622,340		Pike perch.....	*9,600,000	
Colorado:			Rainbow trout.....		16,000
Blackspotted trout.....	160,000		Smallmouth black bass.....	*7,500	
Brook trout.....		1,500	Maine:		
Delaware:			Brook trout.....	100,000	
Black bass.....		375	Lake trout.....	50,000	
Shad.....	*400,000		Landlocked salmon.....	300,000	
Illinois:			Maryland: Brook trout.....	50,000	
Black bass.....		5,040	Massachusetts:		
Brook trout.....	25,000	300	Pike perch.....	25,000,000	
Carp.....		249,000	Shad.....	1,097,000	
Catfish.....		62,900	Yellow perch.....	15,000,000	
Crappie.....		35,390	Michigan:		
Pickerel.....		560	Lake trout.....	3,000,000	
Pike perch.....	20,000,000		Landlocked salmon.....	25,000	
Rainbow trout.....	50,000	9,750	Pike perch.....	26,235,000	
Sunfish.....		6,240	Smelt.....	10,000,000	
Yellow perch.....		1,600	Minnesota:		
Indiana: Pike perch.....	15,000,000		Lake trout.....	200,000	
Iowa: Pike perch.....	25,000,000		Landlocked salmon.....	25,000	
			Steelhead trout.....	250,000	

<sup>a</sup> Fry are indicated by an asterisk, thus (\*); all others are eggs.

## ALLOTMENTS OF FISH AND EGGS TO STATE FISH COMMISSIONS, FISCAL YEAR 1916—Con.

State and species.	Eggs and fry. <sup>a</sup>	Fingerlings, yearlings, and adults.	State and species.	Eggs and fry. <sup>a</sup>	Fingerlings, yearlings, and adults.
Montana:			Pennsylvania:		
Blackspotted trout.....	200,000	.....	Lake trout.....	100,000	.....
Brook trout.....	50,000	.....	Pike perch.....	3,000,000	.....
Catfish.....		940	South Dakota:		
Grayling.....	2,300,000	.....	Brook trout.....		50,000
Pickereel.....		565	Loch Leven trout.....		30,000
Rainbow trout.....	320,000	.....	Pike perch.....	25,000,000	.....
Sunfish.....		625	Utah:		
Yellow perch.....		475	Brook trout.....	100,000	6,000
Nebraska: Pike perch.....	1,500,000	.....	Lake trout.....	50,000	.....
New Hampshire:			Vermont:		
Brook trout.....	50,000	.....	Catfish.....		150
Lake trout.....	100,000	.....	Lake trout.....	201,054	.....
Landlocked salmon.....	25,000	.....	Landlocked salmon.....	50,000	.....
Rainbow trout.....	100,000	.....	Smelt.....	15,000,000	.....
Steelhead trout.....	93,000	.....	Steelhead trout.....	150,000	.....
New Jersey:			Washington:		
Landlocked salmon.....	10,000	.....	Brook trout.....	50,000	.....
Rainbow trout.....	50,000	.....	Blackspotted trout.....	432,000	.....
Smallmouth black bass.....		159	Rainbow trout.....	100,000	.....
Steelhead trout.....	93,000	.....	Wisconsin:		
Yellow perch.....	10,000,000	.....	Lake trout.....	3,500,000	.....
New York: Landlocked salmon.....	25,000	.....	Whitefish.....	5,000,000	.....
North Dakota:			Wyoming:		
Pike perch.....	6,000,000	.....	Blackspotted trout.....	200,000	.....
Steelhead trout.....	93,000	.....	Brook trout.....	50,000	.....
Ohio:			Grayling.....	400,000	.....
Pike perch.....	68,425,000	.....	Lake trout.....	25,000	.....
Whitefish.....	68,640,000	.....	Rainbow trout.....	100,000	.....
Oregon:			Steelhead trout.....	200,000	.....
Blackspotted trout.....	200,000	.....			
Blueback salmon.....	3,000,000	.....	Total.....	{ 377,367,394 *10,507,500 }	{ 478,569 }
Chinook salmon.....	1,000,000	.....			
Silver salmon.....	196,000	.....			
Steelhead trout.....	*500,000	.....			

<sup>a</sup> Fry are indicated by an asterisk, thus (\*); all others are eggs.

## SHIPMENTS OF FISH AND EGGS TO INSULAR POSSESSIONS AND FOREIGN COUNTRIES DURING FISCAL YEAR 1916.

Country and species.	Eggs.	Fingerlings, yearlings, and adults.
Japan: Lobster.....		200
Porto Rico:		
Black bass.....		600
Catfish.....		1,500
Sunfish.....		1,500
Portugal: Rainbow trout.....	50,000	.....
Total.....	50,000	3,800

## DETAILS OF OUTPUT FOR 1916.

The following table shows the work of the different stations in 1916, the periods of operations, and the eggs and fish furnished by each station for distribution. It will be noted that transfers of fish and eggs from station to station are frequent. Such transfers are made in the interest of economy and convenience where the shipments consist of eggs, and give advantageous distribution centers in the case of young fish.

## STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1916.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Afognak, Alaska:					
Entire year.....	Blueback salmon.....		9,307,500	8,900,440	18,207,940
	Humpback salmon.....		6,736,500		6,736,500
Baird, Cal.:					
Entire year.....	Brook trout.....			42,000	42,000
	Chinook salmon.....		435,000	2,029,354	2,464,354
	Rainbow trout.....		14,000		14,000
Battle Creek, Cal.—					
Dec.—Apr.....	Chinook salmon.....	750,000	6,155,950	3,508,870	10,414,820
Hornbrook, Cal.a—					
Oct.—May.....	Chinook salmon.....	15,872,340			15,872,340
	Silver salmon.....		2,169,050		2,169,050
Mill Creek, Cal.a—					
Dec.—Apr.....	Chinook salmon.....	3,000,000	3,350,000	6,400,000	12,750,000
Baker Lake, Wash.:					
Entire year.....	Blueback salmon.....		1,875,000		1,875,000
	Silver salmon.....		277,164		277,164
Birdsview, Wash.a—					
Entire year.....	Blackspotted trout.....		371,310		371,310
	Blueback salmon.....		22,420	520	22,940
	Chinook salmon.....			694,795	694,795
	Humpback salmon.....			2,515,000	2,515,000
	Silver salmon.....	2,500		1,455,490	1,457,990
	Steelhead trout.....	629,000	207,000	800,000	1,636,000
Brinnon, Wash.a—					
Oct.—June.....	Dog salmon.....		1,285,000		1,285,000
	Silver salmon.....		608,000		608,000
	Steelhead trout.....		100,000		100,000
Darrington, Wash.a <sup>1</sup>					
Oct.—Apr.....	Chinook salmon.....		70,000		70,000
	Dog salmon.....		431,000		431,000
	Humpback salmon.....		2,278,000		2,278,000
	Silver salmon.....		580,000		580,000
Day Creek, Wash.a—					
Sept.—June.....	Humpback salmon.....		300,000		300,000
	Silver salmon.....		106,000		106,000
Duckabush, Wash.—					
Sept.—June.....	Chinook salmon.....			108,000	108,000
	Dog salmon.....		11,662,444	1,000,000	12,662,444
	Humpback salmon.....		1,165,000	400,000	1,565,000
	Silver salmon.....		620,000		620,000
	Steelhead trout.....			91,000	91,000
Illabott Creek, Wash.a—					
Sept.—June.....	Chinook salmon.....		27,950		27,950
	Humpback salmon.....		757,500		757,500
	Silver salmon.....		21,800		21,800
Quilcene, Wash.—					
Sept.—June.....	Chinook salmon.....		5,130		5,130
	Dog salmon.....		8,122,500		8,122,000
	Humpback salmon.....		1,428,500		1,428,500
	Silver salmon.....		389,220		329,220
Sultan, Wash.a—					
Sept.—June.....	Chinook salmon.....		108,400		108,400
	Humpback salmon.....		177,400		177,400
	Silver salmon.....		3,387,500		3,387,500
	Steelhead trout.....		34,600		34,600
Battery, Md.:					
Apr.—May.....	Shad.....		5,210,000		5,210,000
	White perch.....	25,000,000	96,500,000		121,500,000
	Yellow perch.....	25,500,000	33,400,000		58,900,000

a For convenience in handling, transfers were made as follows:

Hornbrook to Baird, 18,380 rainbow trout eggs.

Mill Creek to Baird, 2,500,000 chinook salmon eggs.

Birdsview to Craig Brook, 3,500,000; to Green Lake, 3,475,000; to Central Station, 25,000 humpback salmon eggs; to St. Johnsbury, 161,000; to Neosho, 2,000; to Leadville, 98,000; to Seattle, 150,000 steelhead trout eggs.

Brinnon to Duckabush, 113,200 chinook salmon eggs, 607,000 humpback salmon eggs, 9,655,000 dog salmon eggs, 530,000 steelhead trout eggs, 620,000 silver salmon eggs; to Quilcene, 1,500,000 humpback salmon eggs, 2,000,000 dog salmon eggs, 635,000 steelhead trout eggs.

Darrington to Birdsview, 4,000,000 humpback salmon eggs.

Day Creek to Birdsview, 2,519,400 humpback salmon eggs, 82,400 chinook salmon eggs, 492,000 silver salmon eggs, 265,000 steelhead trout eggs.

Illabott Creek to Birdsview, 1,710,000 humpback salmon eggs, 271,000 steelhead trout eggs.

Sultan to Birdsview, 200,000 chinook salmon eggs.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1916—  
Continued.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Boothbay Harbor, Me.: Entire year.....	Cod.....		5,516,000		5,516,000
	Flatfish.....		583,707,000		583,707,000
	Lobster.....		128,500,000	5,423	128,505,423
	Pollock.....		19,800,000		19,800,000
Bozeman, Mont.: <sup>a</sup> Entire year.....	Blackspotted trout.....		835,000		835,000
	Brook trout.....	50,000		560,350	610,350
	Grayling.....	3,500,000	1,843,000		5,343,000
	Rainbow trout.....	320,000		361,750	681,750
	Steelhead trout.....			19,000	19,000
Yellowstone, Wyo.: <sup>a</sup> July-June.....	Blackspotted trout.....	1,427,000	175,000		1,602,000
Bryans Point, Md.: <sup>a</sup> Apr.-May.....	Alewife.....		200,000		200,000
	Shad.....	1,097,000	58,232,700		59,329,700
	Yellow perch.....		137,101,000		137,101,000
Cape Vincent, N. Y.: Entire year.....	Brook trout.....		784,000		784,000
	Lake herring.....		76,000,000		76,000,000
	Lake trout.....		5,553,186		5,553,186
	Landlocked salmon.....		7,000		7,000
	Pike perch.....		50,000,000		50,000,000
	Rainbow trout.....		43,000	9,000	52,000
	Whitefish.....		12,900,000		12,900,000
	Yellow perch.....		13,600,000		13,600,000
Central Station, Wash- ington, D. C.: Entire year.....	Brook trout.....		14,000		14,000
	Humpback salmon.....		15,000		15,000
	Lake trout.....		13,500		13,500
	Pike perch.....		3,100,000		3,100,000
	Rainbow trout.....		10,000		10,000
	Shad.....		850,000		850,000
	Yellow perch.....		2,600,000		2,600,000
Clackamas, Oreg.: <sup>a</sup> Entire year.....	Brook trout.....			54,273	54,273
	Chinook salmon.....		5,523,000	990,124	6,513,124
	Rainbow trout.....			49,900	49,900
	Steelhead trout.....			22,314	22,314
Applegate, Oreg.: <sup>a</sup> Apr.-June.....	Chinook salmon.....		563,500		563,500
	Rainbow trout.....	325,000			325,000
	Silver salmon.....	196,000	488,950		684,950
	Steelhead trout.....	450,000		2,091,265	2,541,265
Big White Salmon, Wash.— Oct.-May.....	Chinook salmon.....		18,845,784	1,086,691	19,932,475
Little White Salmon, Wash.: <sup>a</sup> Oct.-May.....	Chinook salmon.....		18,306,000	5,593,974	23,899,974
Rogue River, Oreg.— Entire year.....	Blackspotted trout.....			20,938	20,938
	Chinook salmon.....	1,000,000	1,952,000	1,550,037	4,502,037
	Silver salmon.....			9,153	9,153
	Steelhead trout.....		500,000	491,626	991,626
Upper Clackamas, Oreg.: <sup>a</sup> Entire year.....	Chinook salmon.....		1,878,400	1,016,000	2,894,400
	Steelhead trout.....			180,600	180,600
Willamette, Oreg.— July-June.....	Shad.....		3,316,845		3,316,845

<sup>a</sup> For convenience in handling, transfers were made as follows:

Bozeman to Northville, 25,000; to Leadville, 100,000 grayling eggs.

Yellowstone to Birdsview, 403,000; to Leadville, 1,926,000; to Spearfish, 771,000 blackspotted trout eggs.

Bryans Point to Central Station, 3,670,000 yellow perch eggs; 979,000 shad eggs.

Clackamas to Upper Clackamas, 2,000,000 chinook salmon eggs.

Applegate to Saratoga, 10,000; to Bozeman, 20,000; to Duluth, 50,000; to Rogue River, 418,480.

Little White Salmon to Big White Salmon, 9,186,000 chinook salmon eggs.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1916—  
Continued.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Cold Springs, Ga.: Entire year.....	Black bass.....			229,500	229,500
	Catfish.....			1,982	1,982
	Sunfish.....			37,900	37,900
	Warmouth bass.....			250	250
Milltown, Ga.— Apr.—June.....	Black bass.....			76,500	76,500
Craig Brook, Me.: <sup>a</sup> Entire year.....	Atlantic salmon.....		509,815		509,815
	Brook trout.....			936,410	936,410
	Humpback salmon.....		2,960,000	229,584	3,189,584
	Scotch sea trout.....			509	509
Upper Penobscot, Me.— Apr.—May.....	Atlantic salmon.....		1,200,000		1,200,000
Duluth, Minn.: <sup>a</sup> Entire year.....	Brook trout.....			376,000	376,000
	Lake trout.....	3,326,054	14,390,000	211,000	17,927,000
	Pike perch.....		3,800,000		3,800,000
	Steelhead trout.....		29,000	15,500	44,500
	Whitefish.....		18,575,000		18,575,000
Edenton, N. C.: Entire year.....	Black bass.....		18,300	15,975	34,275
	Rock bass.....			2,800	2,800
	Shad.....		9,765,000		9,765,000
	Sunfish.....			11,750	11,750
	White perch.....		850,000		850,000
Weldon, N. C.— Apr.—May.....	Striped bass.....		10,071,000		10,071,000
Erwin, Tenn.: Entire year.....	Black bass.....			3,310	3,310
	Brook trout.....			326,550	326,550
	Carp.....			227	227
	Rainbow trout.....			626,100	626,100
	Rock bass.....			15,800	15,800
	Smallmouth black bass.....			740	740
	Sunfish.....			7,850	7,850
Gloucester, Mass.: <sup>a</sup> Entire year.....	Butterfish.....		392,000		392,000
	Cod.....		120,890,000		120,890,000
	Flatfish.....		200,680,000		200,680,000
	Haddock.....		22,170,000		22,170,000
	Lobster.....		200,000		200,000
	Mackerel.....		1,946,000		1,946,000
	Pollock.....		1,087,660,000		1,087,660,000
Green Lake, Me.: Entire year.....	Brook trout.....		994,000		994,000
	Humpback salmon.....		3,036,224		3,036,224
	Lake trout.....		46,637		46,637
	Landlocked salmon.....	225,000	237,000	32,256	494,256
	Smelt.....	36,000,000	15,000,000		51,000,000
Grand Lake Stream, Me.: <sup>a</sup> Entire year.....	Landlocked salmon.....	261,000	119,168	67,730	447,898
Homer, Minn.: <sup>a</sup> Entire year.....	Black bass.....		70,000	17,965	87,965
	Buffalofish.....			375,080	375,080
	Carp.....			309,845	309,845
	Catfish.....			322,581	322,581
	Crappie.....			704,185	704,185
	Pike.....			18,126	18,126
	Pike perch.....		3,550,000		3,552,660
	Rock bass.....			200	200
	Sunfish.....			604,411	604,411
	Yellow perch.....		690,000	105,921	795,92

<sup>a</sup> For convenience in handling, transfers were made as follows:

Craig Brook to Upper Penobscot, 1,770,000 Atlantic salmon eggs.

Duluth to Green Lake, 53,230; to St. Johnsbury, 50,000; to Spearfish, 551,440; to Leadville, 25,000 lake trout eggs.

Gloucester to Boothbay Harbor, 115,533,000 pollock eggs.

Grand Lake Stream to St. Johnsbury, 25,000; to Cape Vincent, 10,000; to Craig Brook, 25,000; to Wytheville, 10,000; to Green Lake, 43,696 landlocked salmon eggs.

Homer to San Marcos, 1,585 crappie; 1,851 catfish.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1916—  
Continued.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
La Crosse, Wis.: Entire year.....	Black bass.....			50,830	50,830
	Brook trout.....			78,500	78,500
	Buffalofish.....			4,300	4,300
	Carp.....			23,000	23,000
	Catfish.....			697,675	697,675
	Crappie.....			142,600	142,600
	Pike.....			5,800	5,800
	Pike perch.....		5,280,000	800	5,280,800
	Rainbow trout.....			77,000	77,000
	Sunfish.....			143,000	143,000
	Yellow perch.....			16,200	16,200
Leadville, Colo.: <i>a</i> Entire year.....	Blackspotted trout.....			1,861,440	1,861,440
	Brook trout.....	480,000	433,000	2,476,800	3,389,800
	Lake trout.....			25,000	25,000
	Rainbow trout.....			220,000	220,000
Louisville, Ky.: Entire year.....	Black bass.....			6,550	6,550
	Rainbow trout.....			16,000	16,000
	Rock bass.....			6,650	6,650
	Smallmouth black bass.....			7,350	7,350
	Sunfish.....			9,550	9,550
Mammoth Springs, Ark.: <i>a</i> Entire year.....	Black bass.....		185,000	27,700	212,700
	Catfish.....			2,000	2,000
	Rock bass.....			108,184	108,184
	Smallmouth black bass.....		341,500	8,353	349,853
	Sunfish.....		33,000	131,000	164,000
Friars Point, Miss.: July-December.....	Black bass.....			7,829	7,829
	Buffalofish.....			180	180
	Carp.....			110	110
	Catfish.....			4,704	4,704
	Crappie.....			17,365	17,365
	Sunfish.....			95	95
Manchester, Iowa: <i>a</i> Entire year.....	Brook trout.....			932,272	932,272
	Pike perch.....		2,900,000		2,900,000
	Rainbow trout.....	494,900		249,250	743,650
	Rock bass.....			4,600	4,600
	Sunfish.....			16,000	16,000
Bellevue, Iowa <i>a</i> — August-December.....	Black bass.....			103,995	103,995
	Buffalofish.....			173,700	173,700
	Carp.....			77,600	77,600
	Catfish.....			140,250	140,250
	Crappie.....			1,845,865	1,845,865
	Pike.....			18,610	18,610
	Sunfish.....			215,770	215,770
	White bass.....			4,950	4,950
	Yellow perch.....			24,050	24,050
North McGregor, Iowa <i>a</i> — August-December.....	Black bass.....			49,575	49,575
	Buffalofish.....			10,600	10,600
	Carp.....			10,100	10,100
	Catfish.....			596,700	596,700
	Crappie.....			261,000	261,000
	Pike.....			900	900
	Sunfish.....			269,800	269,800
	Yellow perch.....			32,850	32,850

*a* For convenience in handling, transfers were made as follows:

Leadville to Manchester, 500,000; to La Crosse, 100,000; to Clackamas, 100,000; to Baird, 100,000; to Saratoga, 200,000 brook trout eggs.

Mammoth Spring to Quincy, 4,000 rock bass.

Manchester to Leadville, 256,700; to Clackamas, 100,000 rainbow trout eggs.

Bellevue to Wytheville, 530 sunfish; to San Marcos, 21,800 crappie; to Neosho, 1,200; to Quincy, 300 catfish.

North McGregor to Bellevue, 2,200 yellow perch.



STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1916—  
Continued.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
Nashua, N. H.: Entire year.....	Brook trout.....		249,300	12,000	261,300
	Catfish.....			354	354
	Rainbow trout.....		15,300	6,438	21,738
	Smallmouth black bass.....		2,400		2,400
Neosho, Mo.: <sup>a</sup> Entire year.....	Black bass.....			29,380	29,380
	Catfish.....			100	100
	Crappie.....			900	900
	Rainbow trout.....			203,390	203,390
	Rock bass.....			4,325	4,325
	Smallmouth black bass.....	3,310		1,196	4,506
	Sunfish.....			11,795	11,795
	Yellow perch.....			310	310
Northville, Mich.: <sup>a</sup> Entire year.....	Brook trout.....		720,000	51,000	771,000
	Grayling.....		25,000		25,000
	Lake trout.....	4,000,000			4,000,000
	Rainbow trout.....		161,500	28,500	190,000
	Smallmouth black bass.....		288,000	38,125	326,125
Alpena, Mich.— Apr.—May.....	Lake trout.....		3,500,000		3,500,000
	Whitefish.....		30,000,000		30,000,000
Charlevoix, Mich.— Apr.—May.....	Lake trout.....		9,408,000		9,408,000
	Whitefish.....		30,000,000		30,000,000
Detroit, Mich.: <sup>a</sup> Dec.—June.....	Pike perch.....	31,735,000	12,600,000		44,335,000
	Whitefish.....	5,000,000	20,000,000		25,000,000
Sault Ste. Marie, Mich.— Apr.—May.....	Lake trout.....		3,500,000		3,500,000
	Whitefish.....		30,000,000		30,000,000
Orangeburg, S. C.: Entire year.....	Black bass.....			135,000	135,000
	Shad.....		772,000		772,000
Put in Bay, Ohio: <sup>a</sup> Entire year.....	Pike perch.....	165,425,000	68,300,000		233,725,000
	Whitefish.....	69,180,000	175,500,000		244,680,000
	Yellow perch.....	2,000,000			2,000,000
Quinalt, Wash.: Entire year.....	Blueback salmon.....		13,840,000	2,665,788	16,505,788
	Chinook salmon.....		29,600	4,810	34,410
	Silver salmon.....		96,650	4,864	101,514
Quincy, Ill.: <sup>a</sup> Entire year.....	Black bass.....			80,450	80,450
	Carp.....			3,915,950	3,915,950
	Catfish.....			779,431	779,431
	Crappie.....			150,411	150,411
	Pike perch.....		1,650,000		1,650,000
	Sunfish.....			127,080	127,080
	Yellow perch.....			1,375	1,375
St. Johnsbury, Vt.: <sup>a</sup> Entire year.....	Brook trout.....	105,000	1,363,900	95,156	1,564,056
	Lake trout.....		3,000	14,190	17,190
	Landlocked salmon.....			3,991	3,991
	Rainbow trout.....			33,000	33,000
	Smallmouth black bass.....		3,000	8,364	11,364
	Steelhead trout.....			55,265	55,265
	Yellow perch.....			3,305	3,305

<sup>a</sup> For convenience in handling, transfers were made as follows:

Neosho to Bellevue, 3,450 rock bass; 1,200 catfish; to Erwin, 596,816; to Clackamas, 106,000 rainbow trout eggs.

Northville to Central Station, 15,000; to Cape Vincent, 1,659,200; to Sault Ste. Marie, 8,500,000; to Charlevoix, 4,408,000; to Alpena, 3,500,000 lake trout eggs.

Detroit to Central Station, 1,120,000; to Sault Ste. Marie, 30,000,000; to Alpena, 30,000,000; to Charlevoix, 30,000,000 whitefish eggs; to Duluth, 18,750,000 pike perch eggs.

Put in Bay to Cape Vincent, 15,000,000; to Central Station, 500,000; to Detroit, 25,880,000; to Duluth, 25,000,000 whitefish eggs; to Homer, 4,000,000; to La Crosse, 6,000,000; to Quincy, 2,000,000; to Manchester, 3,000,000 pike perch eggs.

Quincy to Neosho, 7,400 crappie, 1,000 catfish; to White Sulphur, 250 sunfish.

St. Johnsbury to Central Station, 20,000; to Holden, 409,900 brook trout eggs; to Holden, 37,600 rainbow trout fry.

STATIONS OPERATED AND THE OUTPUT OF EACH FOR THE FISCAL YEAR 1916—  
Continued.

Station and period of operation.	Species.	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Total.
St. Johnsbury, Vt.—Con. Holden, Vt.— Entire year.....	Brook trout..... Lake trout..... Landlocked salmon..... Rainbow trout..... Steelhead trout.....		528,000	7,600 14,100 1,800 13,000 33,888	535,600 14,100 1,800 13,000 33,888
Swanton, Vt.— Mar.—June.....	Pike perch..... Yellow perch.....	25,000,000	63,753,280 8,100,000		88,753,280 8,100,000
San Marcos, Tex.: Entire year.....	Black bass..... Crappie..... Rock bass..... Sunfish..... Warmouth bass.....			370,925 891 11,505 23,110 450	370,925 891 11,505 23,110 450
Saratoga, Wyo.: Entire year.....	Brook trout.....			181,256	181,256
Spearfish, S. Dak.: Entire year.....	Blackspotted trout..... Brook trout..... Lake trout..... Loch Leven trout..... Rainbow trout..... Steelhead trout.....			614,250 527,400 16,525 105,500 101,200 10,600	614,250 527,400 16,525 105,500 101,200 10,600
Tupelo, Miss.: Entire year.....	Black bass..... Crappie..... Sunfish.....		198,500	131,725 85 30,100	330,225 85 30,100
White Sulphur Springs, W. Va.: Entire year.....	Black bass..... Brook trout..... Rainbow trout..... Smallmouth black bass.....			1,015 792,850 251,600 114,000	1,015 792,850 251,600 114,000
Woods Hole, Mass. <sup>a</sup> Entire year.....	Cod..... Flatfish.....		192,275,000 748,560,000		192,275,000 748,560,000
Wytheville, Va.: <sup>a</sup> Entire year.....	Black bass..... Brook trout..... Landlocked salmon..... Rainbow trout..... Rock bass..... Smallmouth black bass..... Sunfish.....			31,550 151,600 4,800 610,759 11,335 1,200 1,290	31,550 151,600 4,800 960,759 11,335 46,700 1,290
Yes Bay, Alaska: <sup>a</sup> Entire year.....	Blueback salmon..... Humpback salmon.....	3,000,000	32,920,000 325,000	20,876,000	56,796,000 325,000
Total output.....		425,700,794	4,330,287,387	93,360,738	4,848,348,919
Loss in transit.....			987,050	99,303	1,086,353
Net output.....		425,700,794	4,329,300,337	92,261,435	4,847,262,566

<sup>a</sup> For convenience in handling, transfers were made as follows:

Woods Hole to Gloucester, 25,769,000 cod eggs.  
Wytheville to Bellevue, 7,500; to Cold Springs, 3,000 rock bass; to Louisville, 250,000; to Nashua, 100,000; to Central Station, 35,000; to Cape Vincent, 100,000; to St. Johnsbury, 100,000; to White Sulphur, 150,000; to La Crosse, 100,000; to Northville, 200,000 rainbow trout eggs.  
Yes Bay to Quinault, 100,000; to Afognak, 15,000,000 blueback salmon eggs.

The eggs hatched at the main stations listed in the foregoing table are in many cases obtained from auxiliary sources, usually temporary stations occupied during the season only or, in some instances, mere camps which are shifted from year to year. In the Great Lakes and off the New England coast collections are made by the Bureau's vessels or boats in favorable localities. The following temporary stations and collecting points furnished eggs of the given species for the main hatcheries during 1916.

## LIST OF EGG-COLLECTING STATIONS, FISCAL YEAR 1916.

Station.	Period of operation.	Species handled.
<b>Alaska:</b>		
Eagle Lake.....	June.....	Blueback salmon.
Ketchikan Creek.....	September-October.....	Humpback salmon.
Seal Harbor.....	June-October.....	Blueback salmon.
Uganak.....	do.....	Do.
<b>Colorado:</b>		
Antero Reservoir.....	April-May.....	Rainbow trout.
Cheesman Lake.....	do.....	Do.
Edith Lake.....	October-November.....	Brook trout.
Engelbrechts Lakes.....	do.....	Do.
Hosselkus Lake.....	do.....	Do.
Kelleys Lake.....	do.....	Do.
Musgroves Lake.....	do.....	Do.
Smiths Ponds.....	do.....	Do.
Northfield Lakes.....	do.....	Do.
Turquoise Lake.....	do.....	Do.
Woodland Park Lake.....	do.....	Do.
<b>Maine: Portland.....</b>	<b>July-October, May-June</b>	<b>Lobster.</b>
<b>Massachusetts:</b>		
Menemsha.....	January-April.....	Flatfish.
Waquoit.....	do.....	Do.
<b>Michigan:</b>		
Alden.....	November.....	Whitefish.
Antrim City.....	do.....	Do.
Bay City.....	April.....	Pike perch.
Bay Port.....	November.....	Whitefish.
Belle Isle.....	October-November.....	Do.
Charity Island.....	do.....	Do.
Detour.....	do.....	Lake trout.
Fairport.....	do.....	Do.
Frankfort.....	do.....	Do.
Grassy Island.....	do.....	Whitefish.
Isle Royal.....	do.....	Lake trout and whitefish.
Keweenaw Point.....	do.....	Do.
Manistique.....	do.....	Do.
Marquette.....	do.....	Lake trout and lake herring.
Monroe.....	April and November.....	Pike perch and whitefish.
Munising.....	October-November.....	Lake trout.
Munoscog.....	April.....	Pike perch.
Naubinway.....	November-December.....	Whitefish.
Ontonagon.....	October-November.....	Lake trout.
St. James.....	October-December.....	Lake trout and whitefish.
Jacobsville.....	October-November.....	Lake trout.
<b>Minnesota: Grand Marais.....</b>	<b>do.....</b>	<b>Do.</b>
<b>Montana:</b>		
O'Dell Creek.....	March-May.....	Grayling.
South Meadow Creek.....	do.....	Grayling and rainbow trout.
<b>New York:</b>		
Amherst Island.....	October-November.....	Lake trout.
Charity Shoals.....	do.....	Lake trout and whitefish.
Horseshoe Island.....	do.....	Lake trout.
Ogdensburg.....	April-May.....	Pike perch.
Old Forge.....	November.....	Whitefish.
Pigeon Island.....	October-November.....	Lake trout.
Pope Mills.....	April.....	Pike perch.
Sodus Point.....	November-December.....	Lake herring.
Stony Island.....	November.....	Lake trout.
Three Mile Bay.....	November-December.....	Lake herring and whitefish.
<b>Ohio:</b>		
Kellys Island.....	do.....	Whitefish.
Middle Bass.....	do.....	Do.
North Bass.....	April and November.....	Pike perch and whitefish.
Port Clinton.....	do.....	Do.
Toledo.....	do.....	Do.
<b>Rhode Island: Wickford.....</b>	<b>February-April.....</b>	<b>Flatfish.</b>
<b>South Carolina:</b>		
Branchville.....	April.....	Shad.
Jacksonboro.....	do.....	Do.
<b>South Dakota:</b>		
La Plant Lake.....	October-January.....	Brook and Loch Leven trout.
Schmidts Lake.....	October-December.....	Brook trout.
<b>Vermont:</b>		
Darling Pond.....	August-December.....	Do.
Lake Mitchell.....	do.....	Do.
<b>Wyoming:</b>		
Clear Creek.....	July and June.....	Blackspotted trout.
Columbine Creek.....	do.....	Do.
Cub Creek.....	do.....	Do.
Lake Camp.....	do.....	Do.
Pelican Creek.....	do.....	Do.

# DETAILS OF DISTRIBUTION OF FISH AND EGGS, BY STATES, WATERS AND SPECIES, DURING THE FISCAL YEAR 1916.

## CATFISH.

Disposition.	Finger- lings, yearlings, and adults.	Disposition.	Finger- lings, yearlings, and adults.
<b>Alabama:</b>		<b>Louisiana:</b>	
Abbeville, Clendinen Mill Pond.....	75	Athens, Jackson's pond.....	1,000
Andalusia, Lime Pond.....	100	Jennings, Canalside Pond.....	1,000
Fort Payne, Big Wills Creek.....	300	McManus, Five Pines Pond.....	100
Monroe's pond.....	100	<b>Maryland:</b>	
Goodwater, McWhorter's pond.....	100	Bowie, Mirror Lake.....	150
Ironton, Chehawhaw Creek.....	300	Buena Vista Springs, Lake Royer.....	800
Jude, Town Creek.....	300	Cumberland, Potomac River.....	300
Roanoke, Waldrep's pond.....	100	Town Creek.....	300
Three Notch, Thornton's pond.....	100	Wills Creek.....	300
Tyson, Marlette's pond.....	100	Taneytown, Goulden's pond.....	1,200
<b>Arizona:</b>		<b>Massachusetts:</b>	
Cochise, Burney's pond.....	400	Clinton, Clamshell Pond.....	200
Douglas, Johnson's pond.....	400	Cochlance Pond.....	200
Prescott, Lake Watson.....	400	Fitchburg, Whalom Lake.....	400
San Simon, Stenzel's pond.....	400	Greenfield, Dam No. 2.....	200
<b>Arkansas:</b>		Horseshoe Pond.....	200
Bellefonte, Woodland Pond.....	100	Lancaster, Big Pond.....	200
Stephens, Jenkin's pond.....	160	<b>Michigan:</b>	
<b>Colorado:</b>		Battle Creek, Mud Lake.....	200
Arlington, Moseley's pond.....	600	Bedding, Kiddville Pond.....	150
Denver, Mud Lakes.....	200	Charlotte, Long Lake.....	300
<b>Florida:</b> Wauchula, Whittington's pond.....	150	Gaylord, Long Lake.....	300
<b>Georgia:</b>		Jackson, Portage Lakes.....	300
Box Springs, King Mill Creek.....	100	Vandercook Lake.....	300
Stringfellow's pond.....	100	Wolf Lake.....	300
Bullochville, Walden's pond.....	100	Jonesville, Courtright Lake.....	300
Burwell, Turkey Creek.....	125	Half Moon Lake.....	300
Columbus, Massey's pond.....	100	Lake, Crooked Lake.....	150
Ram Pond.....	200	Lakeview, Tamarack Lake.....	150
Hillsboro, Wymen & King Pond.....	35	Town Line Lake.....	150
Lineville, Lake Mary Scott.....	150	Marengo, Rice Creek.....	150
Lithonia, Weekes's pond.....	50	Richland, Gull Lake.....	300
Redan, Baboshela Pond.....	50	Long Lake.....	150
Thomson, Smith Cotton Mill Pond.....	100	Scottville, Grey's pond.....	100
Washington, Little River.....	622	Sidnaw, Booth Lake.....	500
<b>Illinois:</b>		Elsner Lake.....	500
Belvidere, Kishwaukee River.....	2,000	Twin Lake, North Lake.....	400
Freeport, Yellow Creek.....	10,400	Vanderbilt, Round Lake.....	
Irving, Wilson's pond.....	200	<b>Minnesota:</b> Homer, Mississippi River.....	a 314,402
Marshall Heath's pond.....	200	<b>Mississippi:</b>	
Meredosia, Illinois River.....	a 775,500	Aberdeen, Smith Lake.....	375
Peytone, Cowing's pond.....	100	Amory, Minor's pond.....	50
Polo, Pine Creek.....	3,000	Liberty, Causey's pond.....	100
Rockford, Rock River.....	700	Macon, Noxubee River.....	75
Vermont, Oakdale Pond.....	200	Osyka, Gladhurst Pond.....	70
<b>Indiana:</b>		Oxford, Callaway's pond.....	50
Brazil, Lambert's pond.....	100	Pontotoc, Johnson's pond.....	100
Chrisney, Jacob's pond.....	100	Patterson Lake (A).....	100
Connorsville, Green Mound Pond.....	200	Patterson Lake (B).....	200
Delaware, Wildmere Lake.....	100	Shannon's pond.....	100
Sunman, Brauer Pond.....	200	Tunnell's pond.....	100
Forthofer Pond.....	200	Rienzi, Pearce's pond.....	50
Robinson Pond.....	200	Trantham's pond.....	60
Weisburg, Gutzwiller's pond.....	200	Tibbee Station, Willow Pond.....	125
Wellsboro, Way Dredge Creek.....	300	Vicksburg, Phillip Pond.....	50
<b>Iowa:</b>		<b>Missouri:</b>	
Bellevue, Mississippi River.....	a 97,500	Everton, Meierhof's pond.....	60
Davenport, Upper Pond.....	200	Mansfield, Lake Crystal.....	300
Eldora, Iowa River.....	600	Miller, Willow Spring Pond.....	100
Exira, Edgeville Lake.....	1,670	Mill Spring, College Lake.....	31
Gravity, Maple Lawn Pond.....	333	Neosho, Turkey Creek.....	100
Lime Springs, Upper Iowa River.....	6,000	Nevada, Simon's pond.....	100
Manchester, Maquoketa River.....	2,590	Norwood, Farm Pond.....	120
North McGregor, Mississippi River.....	a 583,000	Pleasant Mill, Kellogg Lake.....	200
Peru, Emerson's pond.....	333	Lake Blanch.....	200
Steamboat Rock, Iowa River.....	600	Tucker Smith Lake.....	200
Winfield, Pierce's pond.....	333	Pamona, Lake Pippin.....	120
Winterset, Sawyer's pond.....	333	Purcell, Bradford's pond.....	100
<b>Kentucky:</b>		<b>Montana:</b>	
Cadiz, Hammond's pond.....	50	Chinook, Massey's pond.....	300
La Grange, Sugar Grove Lake.....	100	Forsythe, Yellowstone River.....	365
Paducah, Terry's pond.....	50	Glendive, Yellowstone River.....	200
Stanford, Lovell's pond.....	100	Havre, Milk River.....	300
		Miles City, Yellowstone River.....	375

a Rescued from overflowed lands and restored to original waters.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## CATFISH—Continued.

Disposition.	Finger- lings, yearlings, and adults.	Disposition.	Finger- lings, yearlings, and adults.
Nebraska: Verdon, Harden's pond.....	333	Pennsylvania—Continued.	
New Hampshire:		Reading—Continued	
Bartlett, Little Sawyer Pond.....	354	Socany Creek.....	300
Hinsdale, Connecticut River.....	400	Tulpehocken Creek.....	600
New Mexico:		Wyomissing Creek Dam.....	300
Carlsbad, Black River.....	200	Richmond, Dunkle's pond.....	200
Carrizozo, Willow Pond.....	300	Rockwood, Calendar Run.....	300
Cimarron, Antelope Valley Lake.....	400	Rohrestown, Little Conestoga Creek.....	300
Des Moines, Corruppa Creek.....	400	Royersford, Stony Run.....	300
Dulce, Dulce Lake.....	600	Porto Rico: San Juan, Carite Reservoir.....	1,500
Elida, Jippy Pond.....	200	South Carolina:	
Folsom, Preston Lake.....	400	Abbeville, Water Oak Pond.....	100
Kenna, Daisy Dell Pond.....	200	Campobello, Atkin's pond.....	100
Kimmons's pond.....	200	Chester, Grassy Run.....	600
La Lande, Fields's pond.....	200	Greer, Wards Creek.....	100
Mortoya, Laguna Luciano.....	300	Hodges, McIlwain's pond.....	100
Taiban, Singing Water Pond.....	200	Nickel's pond.....	200
Tucumcari, Blue Water Pond.....	300	Honea Path, Clinkscale's pond.....	100
Charcoal Pond.....	300	Leesville, Hare's pond.....	100
Willard, Sandusky's pond.....	200	Liberty, Youngs Lake.....	100
New York:		Monetta, Cat's pond.....	200
Addison, Canisteo River.....	375	Perry, Poole's pond.....	100
Bath, Lake Salubria.....	375	Piedmont, Grove Creek.....	100
Millerton, Indian Pond.....	375	Pomaria, Cannon Creek Lake.....	300
Rudd Pond.....	375	Springfield, Dead Swamp Pond.....	200
North Carolina:		Trenton, Buck Branch Pond.....	100
Burlington, Loch Corinne.....	200	South Dakota:	
Quaker Pond.....	200	Custer, Sylvan Lake.....	450
Greensboro, Todd Pond.....	100	Faith, Beaverdam Creek.....	100
Gulf, Taylor Pond.....	100	Newell, Silver Lake.....	250
North Wilkesboro, Henderson's pond.....	100	Presho, Clear Lake.....	25
Reeves's pond.....	100	Warner's pond.....	25
Ruffin, Vivian Lake.....	100	Wall, Mackerel Lake.....	357
Taylorville, Adams's pond.....	100	Tennessee:	
North Dakota:		Godwin, Shore's pond.....	85
Litchville, Catfish Pond.....	100	Nunnally, Mud Pond.....	85
Oakes, Snow Pond.....	100	Texas:	
Ohio:		Athens, Dunn's pond.....	46
Cincinnati, Klotter's pond.....	200	Harris's pond.....	46
Columbiana, Southside Lake.....	100	Wood's pond.....	46
Geauga Lake, Geauga Lake.....	300	D'Hanis, Leinweber's pond.....	25
Jefferson, Lee's pond.....	200	Mineola, Rock Ford Club Lake.....	60
Russells Point, Lewistown Lake.....	400	Mount Calm, Bower's pond.....	46
Washington Court House, Sugar Creek.....	200	Navasota, Foster's pond.....	60
Oklahoma:		Palestine, Spring Park Lake.....	60
Ardmore, Harrison Pond.....	174	Waxahachie, Ellis Club Lake.....	100
Clinton, Terry's pond.....	100	Vermont: West Danville, Joes Pond.....	150
Todd's pond.....	100	Virginia:	
Colbert, Long Pond.....	400	Berryville, Shenandoah River.....	150
Erick, Holmberg's pond.....	150	Blackwood, Powells River.....	300
Granite, Lake Tanlouse.....	100	Faber, Cove Creek.....	150
Hollis, Salt Fork Lake.....	100	Gate City, Big Moccasin Creek.....	150
Mill Creek, Brewer's pond (A).....	100	Harrisonburg, Custer Mill Pond.....	300
Brewer's pond (B).....	100	West Virginia:	
Mooreland, Jenisch Lake.....	150	Kerens, Leading Creek.....	600
Norge, Hog Creek Pond.....	150	Newburg, Meadow Lake.....	300
Pocasset, Bray's pond.....	150	Sinclair's pond.....	300
Schulter, Sullivan's pond.....	200	Phillippi, Tygarts Valley River.....	600
Tangier, Bosserman's pond.....	100	Simpson, Wendell Lake.....	300
Waukomis, Kid Magnet Creek.....	150	Terra Alta, Sucker Run.....	300
Woodward, Stengelmeir Lake.....	150	Wellsburg, Buffalo Creek.....	600
Pennsylvania:		Wisconsin:	
Benroy, Mill Creek.....	300	Baraboo, Baraboo River.....	1,200
Gap, Pequea Creek.....	300	Beaverdam, Beaverdam Lake.....	5,200
Johnstown, Quemahoning Lake.....	450	Birchwood, Bennett Lake.....	500
Wilmore Pond.....	450	Big Chitac Lake.....	500
Jonestown, Little Swatara Creek.....	300	Huss Lake.....	500
Lebanon, Mount Gretna Lake.....	300	Knudson Lake.....	500
Storer Mill Lake.....	300	Lohyed Lake.....	500
Weidman Lake.....	300	Fond du Lac, Lake De Neveu.....	600
Monocacy, Lewis's pond.....	300	La Crosse, Mississippi River.....	680,000
Montrose, Bixby Pond.....	200	Manitowoc, Kastbaums Lake.....	1,200
Oran Station, Dunn Lake.....	200	Owen, Brick Creek Pond.....	310
Point Marion, Monongahela River.....	300	Wyoming:	
Reading, Angelina Lake.....	300	Lusk, Spring Creek Reservoir.....	333
Antietam Lake.....	300	Newcastle, Beaver Pond.....	250
Bechtel's pond.....	300		
Manatawny Creek.....	300	Total.....	2,545,777

a Rescued from overflowed lands and restored to original waters.

*Details of distribut on of fish and eggs, fiscal year 1916—Continued.*

## CARP.

Disposition.	Finger- lings, yearlings, and adults.	Disposition.	Finger- lings, yearlings, and adults.
Illinois:		New Mexico: Carlsbad, Black River.....	100
Irving, Wilson's pond.....	100	North Carolina: Concord, Coddle Creek..	67
Jacksonville, County Home Pond.....	250	Virginia: Meadow View, Sisk's pond.....	160
Meredosia, Illinois River.....	a 3,915,600	Wisconsin: La Crosse, Mississippi River..	a 23,000
Iowa:		Total.....	4,336,832
Bellevue, Mississippi River.....	a 77,500		
North McGregor, Mississippi River.....	a 10,100		
Minnesota: Homer, Mississippi River.....	a 309,845		
Mississippi:			
Gloster, Bass Lake.....	30		
Houlka, William's pond.....	40		
Vicksburg, Philip Pond.....	40		

a Rescued from overflowed lands and restored to original waters.

## BUFFALOFISH.

Iowa:		Wisconsin, La Crosse, Mississippi River..	a 4,300
Bellevue, Mississippi River.....	a 173,700	Total b.....	563,815
North McGregor, Mississippi River.....	a 10,600		
Minnesota: Homer, Mississippi River.....	a 375,080		
Mississippi:			
Aberdeen, Bream Lake.....	45		
Moon Lake.....	45		
Smith Lake.....	45		

a Rescued from overflowed lands and restored to original waters.

b Lost in transit, 45 fingerlings.

## SHAD.

Disposition.	Fry. <sup>a</sup>	Disposition.	Fry. <sup>a</sup>
Delaware: Delaware City, Delaware River and Bay.....	400,000	North Carolina—Continued.	
District of Columbia: Highway Bridge, Potomac River.....	350,000	Fayetteville, Cape Fear River.....	240,000
Georgia: Savannah, Ogeechee River.....	300,000	Jacksonville, New River.....	215,000
Maryland:		Maysville, Whiteoak River.....	240,000
Accokeek Creek, Potomac River.....	3,009,000	Oregon: Willamette, Willamette River..	3,316,845
Broad Creek, Potomac River.....	1,716,600	South Carolina:	
Bull Cove, Potomac River.....	2,125,900	Branchville, Edisto River.....	282,000
Laurel, Patuxent River.....	500,000	Jacksonboro, Edisto River.....	490,000
Mill Creek, Chesapeake Bay.....	444,000	Lockhart, Broad River.....	270,000
Piscataway Creek, Potomac River.....	11,855,200	Virginia:	
Pomonkey Creek, Potomac River.....	8,019,400	Dogue Creek, Potomac River.....	3,934,900
Swan Creek, Chesapeake Bay.....	3,031,000	Fairy Landing, Potomac River.....	1,607,400
Wild Duck, Chesapeake Bay.....	1,335,000	Little Hunting Creek, Potomac River..	14,342,400
North Carolina:		Occoquan Creek, Potomac River.....	5,612,300
Edenton, Albemarle Sound.....	7,423,000	Pohick Creek, Potomac River.....	950,000
Chowan River.....	200,000	Swan Creek, Potomac River.....	5,059,600
Edenton Bay.....	375,000	Total b.....	77,644,545

a In addition 1,097,000 shad eggs were sent to the Massachusetts State Fish Commission at Palmer, Mass.

b Lost in transit, 502,000 fry.

## ALEWIFE.

Disposition.	Fry.
Maryland: Bryans Point, Potomac River.....	200,000

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## WHITEFISH.

Disposition.	Fry and eggs. <sup>a</sup>	Disposition.	Fry and eggs. <sup>a</sup>
Michigan:		New York—Continued.	
Antrim City, Lake Michigan.....	6,000,000	Grenadier Island, Lake Ontario.....	3,700,000
Atwood Reef, Lake Michigan.....	11,500,000	Lake Pleasant, Pleasant Lake.....	500,000
Belle Isle Park, Detroit River.....	13,500,000	Plattsburg, Lake Champlain.....	1,250,000
Cat Head Reef, Lake Michigan.....	6,000,000	Long Lake West, Little Tupper Lake.....	*300,000
Deckerville, Lake Huron.....	1,500,000	Point Peninsula, Lake Ontario.....	1,500,000
Detour, Lake Huron.....	12,000,000	Port Henry, Lake Champlain.....	1,250,000
Elk Rapids, Elk Lake.....	1,500,000	Rouses Point, Lake Champlain.....	1,250,000
Escanaba, Lake Michigan.....	2,000,000	Three Mile Bay, Three Mile Bay.....	500,000
Fort Wayne, Detroit River.....	5,000,000	Youngstown, Lake Ontario.....	1,000,000
Harbor Springs, Lake Michigan.....	5,000,000	Ohio:	
Manistique, Lake Michigan.....	6,000,000	Catawba Island, Lake Erie.....	10,500,000
Marquette, Lake Superior.....	3,750,000	Isle St. George, Lake Erie.....	30,000,000
Monroe, Lake Erie.....	10,000,000	Kellys Island, Lake Erie.....	30,000,000
Munising, Lake Superior.....	750,000	Marblehead, Lake Erie.....	20,000,000
Naubinway, Lake Michigan.....	3,000,000	Middle Bass, Lake Erie.....	20,000,000
North Point, Lake Huron.....	17,000,000	Port Clinton, Lake Erie.....	20,000,000
Scarecrow Island, Lake Huron.....	13,000,000	Put in Bay, Lake Erie.....	20,000,000
Tobens Harbor, Lake Superior.....	1,800,000	State fish commission.....	*68,640,000
Whitefish Bay, Lake Superior.....	7,000,000	Sandusky, Lake Erie.....	5,000,000
Wrights Island, Lake Superior.....	1,050,000	Toledo, Lake Erie.....	10,000,000
Minnesota:		Pennsylvania: Philadelphia, Fairmont	
Duluth, Lake Superior.....	65,000	Park aquarium.....	*240,000
Grand Marais, Lake Superior.....	2,130,000	Wisconsin:	
Grand Portage, Lake Superior.....	1,140,000	Cornucopia, Lake Superior.....	3,000,000
Susie Island, Lake Superior.....	1,140,000	Delafield, State fish commission.....	*5,000,000
Two Harbors, Lake Superior.....	3,750,000	Total.....	316,975,000
New York:			*74,180,000
Chaumont, Chaumont Bay.....	850,000		
Fullers Bay, Lake Ontario.....	1,100,000		

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

## LAKE HERRING.

Disposition.	Fry.	Disposition.	Fry.
New York:		New York—Continued.	
Chaumont, Chaumont Bay.....	2,300,000	Grimshaw Bay, Lake Ontario.....	8,000,000
Dutch Point, Lake Ontario.....	6,500,000	Point Peninsula, Lake Ontario.....	11,600,000
Fox Island, Lake Ontario.....	13,000,000	Three Mile Bay, Three Mile Bay.....	3,000,000
Fullers Bay, Lake Ontario.....	5,000,000	Trout Bay, Lake Ontario.....	6,100,000
Galloo Island, Lake Ontario.....	13,000,000	Total.....	76,000,000
Grenadier Island, Lake Ontario.....	7,500,000		

## SILVER SALMON.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings.
California: Hornbrook,			Washington—Continued.		
Klamath River.....	2,169,050	-----	Darrington, Hatchery		
New York: New York,			Creek.....	580,000	-----
Aquarium.....	*2,500	-----	Day Creek, Skagit River	94,000	-----
Oregon:			Tingley Creek.....	12,000	-----
Applegate, Applegate			Duckabush, Ducka-		
Creek.....	488,950	-----	bush River.....	620,000	-----
Bonneville, State fish			Illabott, Illabott Creek..	21,800	-----
commission.....	*196,000	-----	Quilcene, Big Quilcene		
Rogue River, Elk Creek		4,994	River.....	264,220	-----
Rogue River.....		4,159	Little Quilcene River.	65,000	-----
Washington:			Quinault, Quinault		
Baker Lake, Skagit			Lake.....	96,650	4,864
River.....	277,164	-----	Sultan, Elwell Creek...	2,881,000	-----
Birdsview, Grandy			Skykomish River.....	506,500	-----
Creek.....		400,000	Total.....	8,684,334	1,469,507
Skagit River.....		1,055,490		*198,500	
Brinnon, Wolcotts					
Slough.....	608,000	-----			

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## CHINOOK SALMON.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
California:			Washington—Continued.		
Baird, McCloud River.....	435,000	2,029,354	Birdsview, Grandy Creek.....		270,000
Battle Creek, Battle Creek.....	6,155,950	3,508,870	Skagit River.....		424,795
Mill Creek, Mill Creek.....	9,750,000		Darrington, Hatchery Creek.....	70,000	
San Francisco, State fish commission.....	*750,000		Duckabush, Dosewallops River.....		9,000
Sisson, State fish Commission.....	*18,872,340		Duckabush River.....		99,600
Oregon:			Illabott, Illabott Creek.....	27,950	
Applegate, Applegate Creek.....	563,500		Little White Salmon, Little White Salmon River.....	18,306,000	5,593,974
Clackamas, Clackamas River.....	5,523,000	990,124	Quilcene, Big Quilcene River.....	5,130	
Medford, State fish commission.....	*1,000,000		Quinalt, Quinalt Lake.....	29,600	4,810
Rogue River, Elk Creek.....	336,000	1,264,037	Sultan, Elwell Creek.....	108,400	
Rogue River.....	1,616,000	286,000			
Upper Clackamas, Clackamas River.....	1,878,400	1,016,000	Total.....	63,650,714 (*20,622,340)	16,582,655
Washington:					
Big White Salmon, Big White Salmon River.....	18,845,874	1,086,691			

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

## BLUEBACK SALMON.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings.
Alaska:			Washington:		
Afognak, Ahuyon Creek.....	967,000	5,860,440	Baker Lake, Skagit River.....	1,875,000	
Letnik Lake.....	8,340,000	3,040,000	Birdsview, Grandy Lake.....	22,420	520
Yes Bay, Hatchery Creek.....	10,675,000	18,676,000	Skagit River.....		
Lake McDonald.....	9,000,000	2,200,000	Quinalt, Quinalt Lake.....	13,840,000	2,665,788
Yes River.....	13,245,000				
Oregon: Bonneville, State fish commission.....	*3,000,000		Total.....	57,964,920 (*3,000,000)	32,442,748

## HUMPBACK SALMON.

Alaska:			Washington:		
Afognak, Ahuyon Creek.....	4,707,000		Birdsview, Grandy Creek.....		1,415,000
Letnik Lake.....	2,029,500		Skagit River.....		1,100,000
Ketchikan, Ketchikan Creek.....	325,000		Darrington, Bennetts Slough.....	2,000,000	
District of Columbia: Washington, Potomac River.....	15,000		Hatchery Creek.....	278,000	
Maine:			Day Creek, Tingley Creek.....	300,000	
Bangor, Penobscot River.....	320,000		Duckabush, Duckabush River.....	1,165,000	400,000
Calais, St. Croix River.....	731,710		Illabott, Illabott Creek.....	757,500	
Dennysville, Dennys River.....	510,840		Quilcene, Big Quilcene River.....	1,328,500	
East Machias, East Machias River.....	738,935		Little Quilcene River.....	100,000	
Ellsworth, Union River.....	144,515		Sultan, Elwell Creek.....	177,400	
Orland, Orland River.....	2,220,000	229,584			
Pembroke, Pennamaquan River.....	510,840		Total.....	19,179,124	3,144,584
South Penobscot, Wrights Pond.....	420,000				
Warren, St. George River.....	399,384				

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## DOG SALMON.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings.
Washington:			Washington—Continued.		
Brinnon, Wolcotts Slough.....	1,285,000	.....	Quilcene, Big Quilcene River.....	7,062,500	.....
Darrington, Bennetts Slough.....	431,000	.....	Little Quilcene River.....	1,060,000	.....
Duckabush, Duckabush River.....	11,662,444	1,000,000	Total.....	21,500,444	1,000,000

## STEELHEAD TROUT.

Connecticut: Mystic, Morgan Pond.....		1,000	Oregon—Continued.		
Maine:			Rogue River, North Fork.....		71,850
Dover, Buttermilk Pond.....		3,500	Union Creek.....		5,000
Piscataquis River.....		1,500	South Dakota:		
Michigan:			Big Stone City, Big Stone Lake.....		5,200
Bergland, Cascade Creek.....		1,000	Fruitdale, U. S. Reclamation reservoir.....		5,400
Calumet, Montreal River.....		250	Vermont:		
Central, Little Gatotot River.....		500	Conicut, Lake Tarleton.....		12,000
Montreal Meadows Pond.....		250	Long Pond.....		1,500
Trap River.....		500	Edgewater, Niggerhead Pond.....		500
Crystal Falls, Paint River.....		1,000	Ely, Fairlee Lake.....		5,000
Delaware, Agate River.....		500	Middle Brook.....		3,000
Iron River, Ice Lake.....	5,000	.....	Fair Haven, Sunset Lake.....		10,000
Ishpeming, Barnhart Creek.....	2,000	.....	Greensboro, Caspian Lake.....		4,000
Mandan, Seward Creek.....		500	Hardwick, Nichols Pond.....		4,000
Silver Creek.....		500	Nichols Pond Brook.....		2,000
Phoenix, Buffalo River.....		500	Orleans, Willoughby River.....		4,000
Minnesota:			Roxbury, State fish commission.....	*150,000	.....
Knife River, MicMac Lake.....		1,500	St. Johnsbury, Sleepers River.....		190
Nigadoo Brook.....		500	South Chittenden, Chittenden Dam.....		8,388
Nippissiquit Lake.....		1,500	Washington:		
Schauff Lake.....		1,000	Birdsview, Grandy Creek.....		800,000
Tettegouche Lake.....		1,500	Skagit River.....	147,000	.....
Peterson, Diamond Creek.....		500	Brinnon, Dosewallops River.....	100,000	.....
St. Paul, State fish commission.....	*250,000	.....	Duckabush, Duckabush River.....		91,000
Montana:			North Bend, State fish commission.....	*100,000	.....
Pony, Mason Lake.....		4,000	North Yakima, Bumping Lake.....	10,000	.....
Waterloo, Jefferson River.....		9,000	Naches River.....	10,000	.....
New Hampshire:			Satus Creek.....	10,000	.....
Bristol, Newfound Lake.....		10,000	Pomeroy, Alpowa Creek.....		2,000
Pike, Lake Tarleton.....		3,575	Pataha Creek.....		4,000
Warren, State fish commission.....	*93,000	.....	Sultan, Elwell Creek.....	34,600	.....
New Jersey: Hacketts-town, State fish commission.....	*93,000	.....	Tacoma, American Lake.....	10,000	.....
New York:			Gravelly Lake.....	10,000	.....
Raquette Lake, Kareoso Lake.....	*100,000	15,000	Stellacoom Lake.....	10,000	.....
Riverside, Schroon Lake.....			Wisconsin:		
North Dakota: St. John, State fish commission.....	*93,000	.....	Brule, Brule River.....		1,500
Oregon:			Donaldson, Black Oak Lake.....		2,000
Applegate, Applegate Creek.....		2,091,265	Gordon, Eau Claire River.....	6,000	.....
Butte Creek, State fish commission.....	500,000	.....	Rice Lake, Miller Creek.....	5,000	.....
Clackamas, Clackamas River.....		109,500	Red Cedar River.....	5,000	.....
Clear Creek.....		30,000	Solon Springs, Moose River.....	6,000	.....
Delf Creek.....		11,900	Wyoming: Laramie, State fish commission.....	*200,000	.....
Eagle Creek.....		29,200			
Eby Springs Creek.....		5,000			
Lemon Creek.....		1,000			
Oregon City, Clear Creek.....		11,314			
Spring Branch.....		5,000			
Rogue River, Elk Creek.....		414,977			
			Total.....	{ 870,600 *1,079,000 }	3,811,058

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Alabama:			Colorado—Continued.		
Birmingham, Mountain Lake.....		4,000	Colorado Springs, Bison Creek.....		1,000
Hillsboro, Dobbins's pond.....		2,000	Creede, Rio Grande River.....		2,000
Guntersville, Smith's pond.....		4,000	Cripple Creek, Edward Frye Pond.....		1,000
Jasper, Long's pond.....		3,000	Gillett Reservoir.....		4,000
Leesburg, Spring Creek.....		6,000	Pleasant Valley Ranch Pond.....		1,000
Arizona:			Rule Creek Pond.....		2,000
Apache, Cave Creek.....		1,000	Debeque, Leon Lake.....		2,500
Safford, Fry Canyon Creek.....		250	Delta, Wier Lake.....		5,000
Jacobson Canyon Creek.....		250	Denver, Bear Creek.....		6,000
Marijilda Canyon Creek.....		500	Jefferson Park Ponds.....		2,000
San Simon, Carr's pond.....		250	Divide, Lashbaugh Lakes.....		3,000
Reservoir No. 2.....		250	Frisco, Jay Bird Pond.....		2,000
Skull Valley, Ferguson Canyon Creek.....		1,250	Georgetown, Naylor Creek.....		5,000
Roberts's pond.....		500	Gunnison, Gunnison River.....	* 27,000	
Wilcox, Boyle Lake.....		250	Hartsel, South Platte River.....		5,000
Winslow, Oak Creek, East Fork.....		1,000	Hot Springs, Cotton Creek Lake.....		500
Arkansas:			Wild Cherry Creek Lake.....		1,000
Cave Springs, Loch Lono.....		500	Lake George, Turkey Creek.....		4,000
Clear Creek, Johnson's pond.....		200	Lyons, St. Vrain Creek.....		5,000
Harrisburg, Town Pond.....		100	Marble, Beaver Lake.....		5,000
Harrison, Mill Creek.....		1,960	Crystal River.....		5,000
Hot Springs, Borman's pond.....		500	Yule Creek.....		5,000
Kensett, Dickey's pond.....		950	Mayfield Spur, Burrow Creek.....		1,000
Mill Creek, Brown's pond.....		200	Moffat, Middle Creek.....		2,000
Olvey, Britton Pond.....		100	Nast, Chapman Lake.....		1,000
Springdale, Clear Creek.....		4,000	Deadman Lake.....		2,000
California:			Prospect, Lilie Lake.....		5,000
Colton, Cedar Springs Pond.....	2,000		Salida, Foss Creek.....		1,000
McFarland, McFarland Reservoirs.....	2,000		Sapinero, Curecanti Creek.....		3,000
Oakland, Smith's pond.....	2,000		South Platte, South Platte River.....		4,000
Point Reyes Station, Lime Gulch Creek.....	* 25,000		Stonington, Arbor Pond.....		500
Rosamond, Lakeview Pond.....	2,000		Tabernash, Cabin Creek.....		5,000
Oakmore Pond.....	2,000		Fraser River.....		5,000
Union Mills, Club Ponds.....	4,000		Victor, No. 2 Reservoir.....		2,000
Colorado:			Walsenburg, Lily Lake.....		500
Almont, Taylor River, Lower.....		3,000	Westcliffe, Venable Lake.....		500
Antero, Antero Reservoir.....		5,000	Weston, Russell Lake.....		6,000
South Platte River.....		6,000	Woodland Park, West Monument Creek.....		2,000
Aspen, Hallam Lake.....		1,000	Georgia:		
Lower Maroon Lake.....		3,000	Ayersville, Dicks Creek.....		4,000
Weller Lake.....		2,000	Bremen, Buck Creek.....		4,000
Boulder, Boulder Creek.....		3,000	Clarksville, Laprade Creek.....		2,000
Jim Creek.....		3,000	Soquee Creek.....		1,000
Left Hand Creek.....		3,000	Cleveland, Chestatow River.....		5,000
Middle Boulder Creek.....		3,000	Copperhill, Fightingtown Creek.....		5,000
South Boulder Creek.....		3,000	Lakemont, Lake Rabun.....		6,000
Buffalo, Buffalo Creek.....		1,500	Mathis, Cliff Creek.....		3,000
Lake Cheesman.....		15,000	Temple, Wrens Pond.....		1,500
Wigwam Creek.....		5,000	Idaho:		
Carbondale, Cortnell's pond.....		500	Deary, Lermo's pond.....		1,000
Thomas Lake.....		2,000	Greer, Wells's pond.....		1,000
Cebolla, Cebolla Creek.....		9,500	Lakeport, Payette Lake.....		3,750
Gunnison River.....		9,500	Samuels, Samuels Lake.....		2,500
Gunnison River, Lower.....		9,500	Shoshone, Silver Creek, headwaters.....		2,500
West Elk Creek.....		2,850	Willow Creek.....		1,250

<sup>a</sup> Eggs are indicated by an asterisk (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
<b>Idaho—Continued.</b>			<b>Maryland—Continued.</b>		
Spirit Lake, Spirit Lake		7,500	Westernport, Stony Run		4,000
Twin Falls, Coulee Pond		1,250	<b>Massachusetts:</b>		
Russell Pond		1,250	Forge Village, Forge Pond	800	
Weiser, Crane Heights Pond		2,500	Georgetown, Maple Pond		800
<b>Illinois:</b>			Great Barrington, Prospect Lake		5,600
Spring Grove, State fish commission	*50,000	9,750	Lancaster, Cumberly Pond	1,200	
Waukegan, Seidmore's pond		500	Lowell, Long Pond	800	
<b>Indiana:</b>			North Littleton, Knopps Pond	800	
Attica, Spring Brook	4,000		Spectacle Pond	800	
La Grange, Graveyard Run	6,000		South Deerfield, Savage's pond		1,600
Michigan City, Grienke Run	3,000		Westfield, Borden Brook Lake		2,400
Township Run	3,000		Westford, Long Sought For Pond	800	
<b>Iowa:</b>			<b>Michigan:</b>		
Anamosa, Buffalo Creek, headwaters		3,000	Buchanan, McCoys Creek	8,000	
Cedar Rapids, Applicant	*1,000		Sampson Creek	5,000	
Postville, Livingood Brook		2,500	Wagner Creek	8,000	
Yellow River		2,500	Charlevoix, Pine Lake		5,000
<b>Kentucky:</b>			Dexter, Huron River	10,000	
Bowling Green, Brushy Fork Creek		300	Fennville, Spring Ridge Pond	1,000	
Jennings Creek		300	Gaylord, Sturgeon River	25,000	
Camp Nelson, Hickman Creek		1,000	Grayling, Tillula Lake	15,000	
Harlan, Clover Fork		3,000	Highland, Dunham Lake		4,000
Martin Fork		3,000	Whalen Lake		4,000
Poor Fork		3,000	Montrose, Glen Lake	4,000	
South Union, Clear Fork Creek		400	Mount Pleasant, Chipewa River		4,700
Clear Creek		6,000	Owosso (applicant)	*200,000	
<b>Maryland:</b>			West Olive, Stone Creek	3,000	
Cowenton, Floral Springs Lake		100	Wingleton, Pere Marquette River		10,500
Cumberland, Rocky Gap Creek		3,000	<b>Minnesota:</b>		
Dorsey, Montevideo Branch		200	Harmony, Big Springs Creek		500
Frostburg, Cassellman River		2,000	Partridge Creek		500
Piney River		1,500	Sanden Creek		500
Puzzley Run		1,500	Willow Creek		1,000
Savage River		1,500	Lake City, Tupper's Pond		2,000
Youghiogheny River		1,500	Peterson, Camp Hazard Creek		500
Glencoe, Piney Run		100	Pine Creek		500
Hagerstown, City Park Lake		300	Preston, Big Spring Creek		1,000
Marsh Run		7,000	Camp Creek		1,300
Willow Lawn Creek		300	Dauschee Creek		1,300
Halethorpe, Gibson's pond		100	Gribbens Creek		800
Lonaconing, Bear Creek		4,000	North Branch		1,300
Black Lick Creek		4,000	Partridge Creek		1,800
Blue Lick Creek		2,500	Rice Creek		800
Chaney Run		4,000	Root River, South Branch		1,300
Mud Lick Creek		2,500	Trout Run Creek		800
Midland, Elk Lick Creek		1,500	Watson Creek		1,300
Oakland, Big Bear Creek, North Fork		3,000	Willow Creek		1,300
Muddy Creek		9,000	Rushford, Austin Creek		1,000
Principio, Principio Creek		200	Big Spring Creek		1,000
St. James, Long Brothers Pond		1,000	Campbell Creek		1,000
Silver Spring, Sligo Branch		2,800	Collidge Creek		1,000
Towson, Hickory Lot Brook		300	Daley Creek		1,000
Long Quarter Brook		300	Diamond Creek		1,000
			Enterprise Creek		1,000
			Ferguson Creek		1,000
			Gribbens Creek		1,000
			Harvey Creek		1,000

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
<b>Minnesota—Continued.</b>			<b>Montana—Continued.</b>		
Rushford, Hemmingway Creek.....		1,000	Becket, McDonald Creek.....		4,000
Iverson Creek.....		1,000	Belgrade, Bull Creek.....		3,000
Looney Valley Creek.....		2,000	Cottonwood Creek.....		3,000
Mead Creek.....		1,000	East Gallatin River.....		4,500
Nepstad Creek.....		1,000	West Gallatin River.....		7,500
Overland Creek.....		1,000	Billings, Elk Lake.....		3,000
Pine Creek (A).....		1,000	Bozeman, Bridger Creek.....		2,000
Pine Creek (B).....		1,000	Cherry Creek.....		2,000
Trout Run Creek.....		1,000	Dudley Creek.....		2,000
Witse Creek.....		1,000	East Rainbow Lake.....		2,000
St. Charles, Ferguson Creek.....		500	Mystic Lake.....		3,000
Nichols Creek.....		500	Pine Creek.....		2,000
Rush Creek.....		500	South Taylor Creek.....		2,000
Trout Run Creek.....		500	Spring Hill Creek.....		2,000
Whitewater River.....		500	Story Lake.....		2,250
St. Cloud, Little Rock Creek.....		3,500	West Bear Creek.....		2,000
Little Watab River.....		1,050	Butte, Delmo Lake.....		5,000
Three Mile Creek.....		1,050	French Gulch Creek.....		8,000
<b>Missouri:</b>			Cardwell, Cold Spring Swamp.....		2,000
Ash Grove, Coppage Lake.....		10,000	Craneville, Crane Creek.....		2,000
Birchtree, Johnny Hol- low Creek.....		5,000	Crystal Spring Pond.....		1,000
Bourbon, Blue Spring Branch.....		16,000	Darby, Beaver Tail Creek.....		1,000
Bunker, Black River, West Fork.....		1,000	Lake Como.....		1,000
Sinking Creek.....		6,700	Trapper Creek.....		2,000
Crane, Crane Creek.....		700	Deer Lodge, Little Blackfoot River.....		5,000
Elk Springs, Elk River.....		1,320	Dell, Bear Creek.....		2,500
Fanning, Elm Spring Lake.....		1,000	Deadman Creek.....		3,000
Goodman, McAntire Lake.....		16,000	Nicholia Creek.....		4,500
Greer, Greer Spring Pond.....		1,000	Teddy Creek.....		3,000
Jaudon, East Creek.....		5,000	Dillon, Rattlesnake Creek.....		4,500
Joplin, Jenkins Creek.....		1,000	Flowerree, Qu'Appelle Creek.....		2,500
Jones Creek.....		11,000	Glangary, Otten's Pond.....		1,000
Kansas City, Tiffany Pond.....		100	Grass Range, Elk Creek.....		4,000
Lisle, Lisle Lake.....		3,000	Hedges, East Coulee Creek.....		4,000
Mansfield, Colonel Pal- mer Pond.....		225	Hilger, Deer Creek.....		3,000
James River and trib- utaries.....		16,000	Moccasin Creek.....		1,000
Monet, Little Flat Creek.....		16,000	Hobson, Acly Creek.....		1,000
Spring River.....		2,000	Nicolson Pond.....		1,000
Neesho, Cedar Creek.....		1,700	Springdale, Beaver Pond.....		1,000
Hickory Creek.....		15,750	Kalispell, Big Fork Creek.....		6,250
Indian Creek.....		6,000	Flathead Lake.....		6,250
Spring Creek.....		120	Lost Creek.....		6,000
White Oak Creek.....		650	Stillwater Creek.....		8,000
Newburg, Little Piney Creek.....		3,750	Wolf Creek.....		6,000
Mill Creek.....		675	Lewistown, Little Wol- verine Pond.....		1,000
Noel, Elk River, tribu- tary of.....		20,000	Marshall Lake.....		1,000
Ridgley, Shoal Creek.....		250	Spring Creek Pond.....		1,000
Rolla, Little Pine Creek.....		1,000	Libby, Granite Creek.....		2,500
St. Joseph, State fish commission.....	*152,400		Leigh Lake.....		2,500
Salem, Current River.....		16,000	Parmenter Creek.....		1,250
Seneca, Cave Creek.....		200	Pipe Creek.....		2,500
Lost Creek.....		2,000	Lodge Grass, Little Big Horn River.....		600
Springfield, Mahans Creek.....		2,200	Madison Valley, State fish commission.....	*320,000	
Vale, Little Blue Creek.....		8,000	Manhattan, Baker Creek.....		1,500
Verona, Spring River.....		1,000	Rigley Creek.....		4,500
Wayne, Roaring River.....		2,000	Martinsdale, Spring Creek.....		6,000
<b>Montana:</b>			Trout Lake.....		4,000
Alder, Ruby River.....		9,000	Miles City, Tongue River.....		8,000
Anaconda, Barker Lake.....		3,000	Missoula, Belmont Creek.....		2,000
			Blackfoot River.....		4,000

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Montana—Continued.			New Jersey—Continued.		
Missoula, Gold Creek.....		2,000	River Edge, Zabriskies Brook.....		200
Johnson Creek.....		1,000	Whitings, Cedar Crest Pond.....		200
Twin Creek.....		1,000	New Mexico:		
Union Creek.....		1,000	Glorietta, Spirit Lake.....		2,000
Monida, Odell Creek.....		3,000	Las Vegas, Ortiz Lake.....		4,000
Red Rock Creek.....		6,000	Magdalena, San Mateo Canyon.....		1,000
Norris, Cedar Creek.....		10,000	Santa Fe, Tesuque River.....		3,000
Lake Irene.....		16,000	Taos Junction, Pueblo Lake.....		2,000
Park City, Linger's pond.....		1,000	Valdez Pond.....		1,000
Pony, South Willow Creek.....		6,000	New York:		
Watt Lake.....		6,000	Bayside, Palmetto Lake.....		200
Red Rock, Sager Creek.....		6,000	Benson Mines, Star Lake.....	5,000	
Spring Branch.....		3,000	Cambridge, Owl Creek.....		5,000
Rosfork, Crooked Creek.....		1,000	Cortland, Grout Brook.....	2,000	
Roy, Ford Creek.....		3,000	Deposit, Oquaga Creek.....		1,500
Sappington, Antelope Pond.....		1,000	Sky Lake.....	4,000	
Jefferson River.....		13,500	Fulton, Windmill Creek.....	4,000	
Lake Jefferson.....		1,000	Great Bend, Black Creek.....	4,000	
Silver Star, Weingart's pond.....		3,000	Hubbard Creek.....	4,000	
Somers, Finley Lake.....		4,000	New York, Aquarium.....	* 7,500	9
Stevensville, Mill Creek.....		4,000	Oriskany, Oriskany Creek.....	4,000	
North Burnt Fork Creek.....		3,000	Pawling, School Pond.....		200
Sweet Grass, Price Lake.....		1,000	Phoenicia, Esopus Creek.....	4,000	
The X Lake.....		1,000	Preble, Bennett Hollow Brook.....	3,000	
Troy, Kilbrennan Lake.....		1,250	Tioughnioga River.....	3,000	
Whitehall, Mayflower Pond.....		1,000	Scarsdale, Franck's pond.....		100
Nebraska:			Sherburne, Swamp Brook.....	2,000	
Chadron, Beaver Creek.....		3,000	Shushan, Battenkill River.....		8,000
Bordeaux Creek.....		4,000	Spring Valley, Frederick's pond.....	1,000	
Dead Horse Creek.....		4,000	Syracuse, Butternut Creek.....		3,400
Little Bordeaux Creek.....		4,000	Chittenango Creek.....		2,800
Spring Creek.....		2,675	Hitchcock Brook.....		700
Crawford, White River.....		2,400	Limestone Creek.....		3,400
Nevada:			Nine Mile Creek.....		3,500
Deeth, Mountain View Pond.....		250	Onondaga Creek.....		3,900
Golconda, Humboldt River.....		1,000	West Nyack, Sloan Pond.....		200
New Hampshire:			Whitney Point, Nanticoke Creek.....	3,000	
Bristol, Able Brook.....		800	North Carolina:		
Brayley Brook.....		800	Asheville, Bee Tree Creek.....		3,000
Cockermouth River.....		800	Flat Creek.....		4,000
Fowler River.....		800	Rheems Creek and tributaries.....		6,000
Hazleton Brook.....		800	Biltmore, Cane Creek.....		5,000
Pemigwassee River.....	1,600		Black Mountain, Lang Branch.....		2,000
Smith River.....		800	Swananoa River, Left Fork.....		2,000
Tilton Brook.....		800	Swananoa River, North Fork.....		4,000
Whittemore Brook.....	800		Swananoa River, Sugar Fork.....		3,000
Woodman Brook.....	800		Boonford, Big Crabtree Creek.....		7,000
Canaan, Andrews Brook.....	800		Brevard, Kings Creek.....		2,000
Orange Brook.....	800		Burnsville, Bowline Creek.....		4,000
Greenfield, South Brook.....	800		Cherryfield, Cherryfield Creek.....		2,000
Keene, Branch Brook.....	1,600				
Lancaster, Little Pond.....	800				
Nashua, Snow Quarry Pond.....	500				
Newbury, Lake Sunapee.....		838			
Pike, Lake Tarleton.....	1,600				
Warren, State fish commission.....	* 100,000				
New Jersey:					
Hackensack, Coles Brook.....		200			
Hackettstown, State fish commission.....	* 50,000				
Pennington, Trap Rock Creek.....		200			
Red Bank, Boar Bura Pond.....		800			

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
North Carolina—Contd.			North Carolina—Contd.		
Doughton, Brush Creek.....		4,000	Waynesville, Riddle Cove Creek.....		3,750
Brush Creek, Laurel Fork.....		2,000	Taylor Creek.....		3,750
Elkland, Horse Creek.....		50,000	Turner Creek.....		3,000
Meat Camp Creek and tributaries.....		1,250	Willetts, Scotts Creek.....		4,000
New River.....		5,000	North Dakota:		
Elk Park, Jones Creek.....		4,000	Mott, Schaff's lake.....		300
Flat Rock, Fall Creek.....		2,000	Ohio:		
Franklin, Buck Creek.....		1,000	Belleville, Gatton's pond.....	1,000	
Cullasaja River.....		4,000	Honey Creek.....	4,000	
Watauga Creek.....		3,000	Wade's lake.....	1,000	
Greensboro, Beech Pond.....		900	Castalia, Trout Stream.....	5,000	
Minnie Branch.....		2,000	Mansfield, Baker Creek.....	10,000	
Hendersonville, Big Henry Creek.....		4,000	Honey Creek.....	10,000	
Kanuga Lake.....		4,000	Parry Lake.....	2,000	
Little Hungry Creek.....		4,000	Reynolds Run.....	4,000	
Hominy, Stony Fork Creek.....		3,000	Styerts Creek.....	10,000	
Hot Springs, Spring Creek.....		5,000	Switzer Run.....	5,000	
Spring Creek, Meadow Fork.....		3,000	Taggart Creek.....	6,000	
Kannapolis, Kannapolis Pond.....		2,000	New Carlisle, Silver Lake.....		2,500
Lake Toxaway, Lake Toxaway.....		10,000	Ravenna, Barrell Run.....	3,000	
Montezuma, Kaintuck Creek.....		12,000	Rock Creek.....	3,000	
Morrisville, Lynn's pond.....		3,000	Oregon:		
Sorrell's pond.....		2,000	Clackamas, Mill Creek.....		4,000
Mortimer, Harpers Creek, Forks of.....		5,000	Gresham, Little Rock Creek.....		5,900
Murphy, Bell Creek.....		3,500	Silverton, Abaqua Creek.....		5,000
Davis Creek.....		3,000	Butte Creek.....		4,000
North Wilkesboro, Bobs Creek.....		3,000	Pennsylvania:		
Buffalo Creek.....		3,000	Altoona, Mill Run.....		600
Elk Creek.....		3,000	Sandy Run.....		2,000
Laytown Creek.....		6,000	Ashcom, Clear Creek.....		3,000
Masters Branch.....		2,000	Cove Creek.....		5,000
Pegg Branch.....		2,000	Bedford, Cove Creek.....		5,000
Ready Branch.....		2,000	Shovers Run.....		5,000
Vanda Branch.....		2,000	Bellwood, Bells Gap Run.....		600
Winkler Creek.....		2,000	Logan Springs Run.....		175
Yadkin River, Stony Fork.....		3,000	Benton, Coles Creek.....		1,000
Old Fort, Jarretts Creek.....		9,000	Fishing Creek.....		2,600
Roaring River, Mathis's pond.....		1,000	Johnson Run.....		400
Ronda, Mathis's pond.....		1,000	Little Fishing Creek.....		1,500
Runion, Big Creek.....		3,000	West Creek.....		1,500
Hickeys Fork Creek.....		4,000	Blain, Fowlers Run.....		600
Little Laurel Creek.....		4,000	Sheaffers Run.....		600
Selica, Cathey Creek.....		4,000	Cedar Hollow, Valley Creek.....		6,000
Spruce Pine, Harrison's pond.....		2,000	Chester, Ridley Creek.....		2,000
Thurmond, Big Elkin Creek, tributary of.....		2,250	Clearfield, Alex Branch.....		1,100
Mitchell River.....		2,000	Alder Run.....		450
Royal City Creek.....		2,000	Bald Hill Run.....		950
Tryon, Pacolet River.....		4,000	Bee Hollow Run.....		1,250
Tuckerdale, Little Horse Creek.....		1,250	Big Lick Run.....		1,600
Tuxedo, Green River.....		12,000	Big Montgomery Creek.....		1,600
Rock Creek.....		2,000	Big Moose Creek.....		1,600
Warrensville, New River, North Fork.....		1,500	Big Trout Run.....		2,050
Waynesville, Brier Ridge Creek.....		4,500	Billotts Run.....		150
Jonathan Creek.....		4,000	Bird Run.....		800
Love Creek.....		6,000	Black Thicket Run.....		800
Mill Creek.....		6,000	Boson Run.....		800
Reuben Creek.....		6,000	Brewer Run.....		800
			Butler Run.....		950
			Carnes Run.....		1,600
			Carrs Run.....		800
			Cherry Run.....		800
			Chestnut Run.....		800
			Christs Run.....		150
			Cold Creek.....		1,900
			Condriet Run.....		150
			Crooked Run.....		950
			Debeck Run.....		800
			Deer Creek.....		300
			Deloy Run.....		150

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
Pennsylvania—Contd.			Pennsylvania—Contd.		
Clearfield, Dixon Run.....		1, 750	Clearfield, Sankey Run.....		800
Doctors Fork Run.....		800	Schucker Run.....		800
Dolsa Run.....		800	Selfridge Run.....		150
Dry Hollow Run.....		950	Shaws Run.....		800
Dunlap Run.....		300	Shope Run.....		800
Elder Run.....		800	Silvis Run.....		150
Fern Branch Run.....		150	Singletree Run.....		800
First Hollow Run.....		150	Smith Run.....		800
Flegal Run.....		800	Spence Run.....		300
Fork Run.....		950	Spring Run.....		800
Garden Draft Run.....		800	Spruce Island Run.....		300
Graham Run.....		950	Stone Run.....		1, 600
Graham Hollow Run.....		800	Stone Hammer Run.....		800
Grapevine Run.....		800	Stone Quarry Run.....		800
Griffin Run.....		800	Stoney Battery Run.....		800
Gum Swamp Run.....		800	Stum Lick Run.....		150
Hamton Run.....		800	Sulfridge Run.....		800
Haney Run.....		800	Sutton Run.....		800
Harvey Branch.....		300	Tar Hollow Run.....		800
Hollow Bend Run.....		300	Tarkill Run.....		1, 600
Hoobler Spring Run.....		950	Tate Run.....		800
Horn Shanty Run.....		300	Thompson Run.....		800
Hubler Run.....		800	Thompson Reed Run.....		800
Irwin Run.....		950	Toppies Run.....		300
Jerry Run.....		800	Upper Buck Run.....		300
Jones Run.....		800	Wallace Run.....		800
Judy Run.....		150	Walnut Hollow Run.....		800
Knepp Run.....		800	Welder Swamp Run.....		800
Koozer Run.....		150	Wilson Run.....		800
Krepps Hollow Run.....		800	Witchhazel Run.....		800
Kurtz Run.....		800	Wolf Run.....		800
Kyler Run.....		150	Woodland Run.....		950
Laurel Run.....		1, 600	Woods Run.....		800
Laying Rock Run.....		800	Yeasie Run.....		150
Lenders Run.....		800	Coalport, Barrett Run.....		1, 500
Lick Run.....		450	Bear Run.....		1, 500
Little Deer Creek.....		300	Kutruff Run.....		1, 500
Little Lick Run.....		800	Noel Run.....		1, 200
Little Moose Creek.....		800	South Witmer Run.....		1, 800
Little Trout Run.....		300	Wilson Run.....		1, 800
Lower Buck Run.....		300	Coatesville, Broad Run.....		200
Maines Run.....		300	Two Log Run.....		200
Mignor Run.....		300	Coudersport, Baker Run.....		1, 200
Millstone Run.....		800	Bell Run.....		1, 800
Molasses Run.....		800	Bishop Creek.....		300
Moravian Run.....		1, 900	Byam Hollow Run.....		900
Morgan Run.....		450	Card Creek.....		1, 800
Moses Run.....		300	Cherry Springs Branch.....		1, 800
Mosquito Run.....		800	Cobb Hollow Run.....		1, 800
Norris Branch.....		300	Crystal Springs Pond.....		175
Ogden Run.....		950	Darien Run.....		900
Orr Run.....		800	Dingman Run.....		175
Ost Haney Run.....		800	Dry Run.....		300
Patchell Run.....		800	Dwight Run.....		300
Pine Hollow Run.....		150	Elk Lick Creek.....		1, 800
Pine Swamp Run.....		800	Elm Flat Run.....		1, 800
Pitch Pine Run.....		950	Fishing Creek.....		1, 800
Raccoon Run.....		300	Fishing Creek, East Branch.....		1, 800
Rankin Run.....		150	Fisk Hollow Run.....		1, 800
Rattlesnake Run.....		950	Heth Run.....		1, 800
Red Run.....		800	Indian Run.....		900
Reeds Run.....		950	Judd Run.....		175
Right Branch.....		800	Lanegar Creek.....		1, 800
Robert's Run.....		950	Lehman Run.....		175
Rock Run.....		800	Lent's pond.....		175
Rock Hollow Run.....		950	Little Moores Run.....		1, 800
Rocky Branch Run.....		300	Lyman Run.....		2, 700
Ross Run.....		800	Matteson Run.....		900
Rosser Run.....		800	Mill Creek.....		300
Sam Reed Run.....		800	Moores Run.....		1, 975
Sandbar Run.....		800	Neefe Run.....		1, 800
Sanborn Run.....		300	Nelson Run.....		175
Sanders Run.....		800	North Hollow Run.....		1, 800
Sand Spring Run.....		800	Peet Run.....		1, 800
Sandy Run.....		1, 100			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
Pennsylvania—Contd.			Pennsylvania—Contd.		
Coudersport, Pine Run.....		900	Hamburg, Peerless Pond.....		100
Prossers Run.....		1,975	Hulls, Big Hollow Run.....		500
Prouty Creek.....		3,000	Birch Run.....		1,000
Prouty Creek, East Branch.....		900	Black Stump Run.....		500
Prouty Creek, West Branch.....		1,800	Camp Run.....		500
Reed Run.....		1,975	Gravel Lick Run.....		500
Rees Run.....		175	Horton Run.....		1,000
Sartwell Creek.....		1,800	Jamison Run.....		1,000
Sinnemahoning Creek, South Branch.....		2,700	Johnson Run.....		1,000
South Branch.....		300	Mud Lick Branch.....		500
South Hollow Run.....		900	Sinnemahoning Creek, East Fork.....		1,500
South Woods Branch.....		1,800	Stony Lick Run.....		1,000
Steer Run.....		175	Vag Hollow Run.....		1,000
Sunken Creek.....		1,800	Williams Run.....		500
Tannery Hollow Run.....		900	Huntingdon, Stone Creek.....		600
Toles Run.....		175	Stone Creek, East Branch.....		600
Trout Run.....		1,800	Hyner, Abes Fork Run.....		3,000
Wambold Run.....		175	Irvona, Hockenberry Run.....		1,800
White Chopping Run.....		1,800	Jamison City, Big Run.....		400
Cresco, Bushkill Creek.....		3,000	Blackberry Run.....		400
Laurel Run.....		1,500	Grassy Hollow Branch.....		400
Stony Creek.....		1,500	Gwin Branch.....		400
Cresson, Conemaugh Creek, North Branch.....		3,000	Ted Run.....		400
Curry, Beaver Creek.....		2,000	Johnstown, Alwine R.....		100
Denver, Hill Run.....		1,500	Baker Run.....		1,000
Dudley, Trough Creek.....		2,400	Beaverdam Run.....		100
Easton, Durham Creek.....		300	Bens Creek.....		1,600
Martins Creek.....		200	Bens Creek, North Fork.....		100
Ebensburg, Connory Run.....		1,800	Bens Creek, South Fork.....		100
Noles Run.....		900	Big Mill Creek.....		1,000
Everett, Brush Creek.....		4,000	Blue Hole Run.....		100
Burke Spring Run.....		1,000	Bobs Creek.....		100
Cave Creek.....		3,000	Brush Creek.....		100
Culvert Run.....		1,000	Card Machine Run.....		100
Deer Lick Run.....		1,000	Clear Run.....		100
Elbow Run.....		2,000	Clear Shade Run.....		1,600
Juniata River, Rays-town Branch.....		4,000	Coxes Creek.....		100
Oregon Run.....		1,500	Cub Run.....		100
Roaring Run.....		2,400	Dalton Run.....		1,100
Tarkill Run.....		1,000	Deeters Creek.....		100
Tunnill Run.....		1,000	Drakes Run.....		100
Wooden Bridge Run.....		1,000	Elk Lick Run.....		100
Fairfield, Marshall Run.....		1,600	Figart Run.....		1,600
Toms Creek.....		2,400	Fishing Run.....		100
Fishing Creek, Fishing Creek.....		4,000	Glade Run.....		100
Flinton, Dutch Run.....		1,800	Henaaries Creek.....		2,100
Wire Rock Run.....		1,200	Hills Creek.....		100
Flowing Spring, Canoe Creek.....		600	Hinckston Run.....		100
Gaines Junction, Chaffee Run.....		1,000	Hoozer Run.....		100
Elk Run.....		3,000	Johns Mills Run.....		200
Johnson Run.....		1,000	Jones Run.....		100
Knowlton River.....		1,000	Kellers Run.....		100
Phoenix Creek.....		3,000	Laurel Run (A).....		1,600
Thompson Hollow Run.....		1,000	Laurel Run (B).....		100
Gallitzin, Beaverdam Creek.....		2,000	Laurel Run (C).....		100
Gannister, Piney Creek.....		600	Laurel Hill Run.....		100
Gap, Livingstone Run.....		4,000	Little Pine Run.....		100
Garden, Valley Creek.....		6,000	Mill Creek.....		100
Gilltown, Black Mos-hannon Creek.....		600	Millers Run.....		100
Heckland Run.....		300	Negro Glade Run.....		100
Glen Mawr, Muncey Creek.....		2,500	Picking Run.....		100
			Piney Run (A).....		100
			Piney Run (B).....		100
			Rachel Run.....		100
			Red Run.....		100
			Roaring Run.....		100
			Salt Lick Run.....		1,100
			Shaffer Run.....		100
			Shannon Run.....		100



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
Pennsylvania—Contd.			Pennsylvania—Contd.		
Jamison City, Solomons Run.....		1,000	Phillipsburg, Ardells Run.....		1,200
Stuart Run.....		1,000	Benners Run.....		1,200
Sugar Run.....		1,000	Black Bear Run.....		1,200
Three Spring Run.....		1,000	Black Moshannon Creek.....		2,400
Tub Mill Run.....		1,000	California Run.....		1,200
Whites Creek Run.....		1,000	Clover Run.....		1,200
Wildcat Creek.....		100	Forge Run.....		1,800
King of Prussia, Valley Creek.....		6,000	Moravian Run.....		1,800
Kinzers, Bethania Creek.....		4,000	Morgan Run.....		1,200
Lancaster, Little Marsh Run.....		2,000	Pine Run.....		1,200
Leesport, DeTurk's pond.....		200	Rock Run.....		1,200
Lemont, Spring Creek.....		7,000	Six Mile Run.....		1,200
Lewistown, Lingle Run.....		350	Slate Run.....		1,200
New Lancaster Valley Creek.....		350	Smays Run.....		1,200
Treasler Valley Creek.....		600	Spruce Run.....		1,200
Lloydell, Beaver Run.....		1,800	Sterling Run.....		1,200
Conemaugh River, South Fork.....		2,400	Tom Tit Run.....		1,200
Lykens, Powells Creek.....		20,000	Phoenixville, Powder Mill Run.....		1,200
Mackeesville, Brookside Run.....		1,000	Picture Rocks, Greggs Run.....		600
Fishing Creek.....		2,500	Laurel Run.....		600
Mahanoy City, Lakeside Lake.....		200	Muncey Creek.....		600
Meadville, Gravel Run.....		1,250	Planebrook, Valley Creek.....		3,000
Little Sugar Creek.....		1,250	Pocono Lake, Toby-hanna Creek.....		300
Meyersdale, Big Pine Run.....		600	Tunkhannon Creek.....		200
Big Spring Run.....		600	Portage, Beaverdam Creek.....		1,000
Bittner Run.....		300	Cedar Creek.....		1,000
Brush Creek.....		600	Pottsville, Dieter Creek.....		400
Durst Run.....		300	Prompton, Prompton Creek.....		400
Elk Lick Creek.....		600	Punxsutawney, Little Sandy Creek, branch of.....		1,250
Flaugherty Creek.....		600	Ralston, Basid Creek.....		300
Glade Run.....		300	Miners Run.....		300
Kendall Run.....		300	Rock Run.....		300
Little Pine Run.....		300	Winslow Creek.....		300
Miller Run.....		300	Reading, Mengel's pond.....		200
Savage Run.....		300	Reese, Cave Run.....		1,000
Sechler Run.....		300	Ringtown, Girard Pond.....		2,500
Snoot Run.....		300	Roaring Springs, Beaver Creek.....		600
Tub Mill Run.....		600	Rockwood, Laurel Hill Creek.....		3,600
Ware Run.....		300	Rossiter, Strait Branch.....		2,000
Mill Creek, Saddlers Creek.....		3,000	Royersford, Gunpowder Run.....		3,000
Mill Hall, Fishing Creek.....		1,500	Johnson Run.....		3,000
Mill Lane, Valley Creek.....		3,000	Paddys Run.....		3,000
Morrisdale, Enigh Run.....		2,000	Pigeon Creek.....		6,000
Little Run.....		2,000	Royal Springs Run.....		2,000
Moravian Run.....		3,000	Stony Run.....		5,000
North Run.....		2,000	Sand Patch, Spring Run.....		1,500
Mount Union, Black Log Creek.....		2,000	Sandy Lake, Plum Lake.....		250
Boohers Gap Run.....		2,000	Shrewsbury, Deer Creek.....		8,000
Carter Run.....		4,000	Slate Run, Little Slate Run.....		9,000
Lower Licking Creek.....		3,000	Smithfield, Victor Run.....		300
Munster, Winterset Run.....		300	Spring City, Rock Run.....		400
Narvon, Little Cones-toga Creek.....		2,000	Stillwater, Fishing Creek.....		400
Shirks Run.....		2,000	Sunbury, Shipman's pond.....		200
New Centerville, Valley Creek.....		6,000	Tryonville, Muddy Creek.....		1,250
Norristown, Meadow Brook Lake.....		100	Unionville, Benners Run.....		2,000
Oil City, Hemlock Run.....		1,250	De Witts Run.....		2,000
Porcupine Run.....		1,250	Waterville, Otter Run.....		800
Osceola Mills, Coal Run.....		5,000			
Paddy Mountain, Penns Creek.....		600			
Paoli Road, Valley Creek.....		3,000			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
Pennsylvania—Contd.			South Dakota—Contd.		
Watson town, White Deer Creek.....		400	Rapid City, Cottonwood Lake.....		2,500
Waynesboro, Kaufmans Run.....		400	Lockhart Pond.....		1,000
West Chester, Radley Run.....		2,000	Murphy Pond.....		1,500
West Hickory, Berlin Branch.....		1,200	Rapid Creek, tributaries of.....		2,000
Bobs Creek.....		1,600	Rounds Pond.....		1,500
Darling Branch.....		1,200	Schamber Pond.....		1,000
East Hickory Creek.....		1,800	Scott Pond.....		1,000
Frog Run.....		800	Spearfish Authier's pond.....		1,000
Hazelton Run.....		800	Choodies Gulch Creek.....		1,000
Hickory Creek.....		1,800	Franklin Creek.....		400
Piney Run.....		1,050	Higgins Gulch Creek.....		1,000
Wharton, Bailey Run.....		300	Hitzell's pond.....		1,000
Williamsburg, Yellow Springs Run.....		300	Lindley Branch.....		500
Williamsport, Big Bear Creek.....		300	Spring Creek.....		500
Windber, Beaver Run.....		2,000	Sturgiss, Bear Butte Creek.....		1,000
Biscuit Run.....		2,000	Whitewood, Peterson Pond.....		1,000
Bobs Creek.....		2,000	Smith Pond.....		500
Butler Run.....		2,000	Tennessee:		
Cane Run.....		2,000	Apison, Miller's pond.....		2,000
Little Paint Creek.....		2,000	Bristol, Susong Creek.....		5,000
Otter Run.....		2,000	Doe, Doe Creek.....		6,000
Roaring Fork Run.....		2,000	Ducktown, Tumbling Creek.....		10,000
Sandy Run.....		2,000	Elkmont, Little River.....		24,500
Shingle Run.....		2,000	Little River, East Prong.....		15,500
Wrightsville, Crystal Run Pond.....		400	Pigeon River.....		13,000
Youngdale, McElhattan Run.....		5,000	Erwin, Higgins Creek.....		5,250
South Carolina:			North Indian Creek.....		48,650
Creston, Lake View.....		3,000	Toney Run.....		1,500
Landrum, Sunnyside Pond.....		1,000	Forks, Little River, Middle Prong.....		10,000
Pickens, Cedar Creek.....		3,000	Garber, Little Cherokee Creek.....		5,000
Little Laurel Creek.....		2,000	Greenville, Farnsworth Brook.....		3,000
Mauldin's pond.....		1,000	Johnson City, Greenbrier Creek.....		10,000
Thompson River.....		4,000	Rockland Spring Pond.....		1,000
Whitewater River.....		5,000	Sinking Creek.....		6,000
River Falls, Devils Fork Creek.....		2,250	Knoxville, Little Pigeon River, West Prong.....		6,000
Gap Creek.....		2,250	Mount Pleasant, Cecil Lake.....		4,000
Walhalla, Whitewater River.....		5,000	Oakdale, Brookcroft Creek.....		4,000
South Dakota:			Sevierville, Pigeon River and branches.....		16,500
Bellefourche, Sundquist Lake.....		500	Sparta, Officer's pond.....		2,000
Buffalo Gap, Beaver Creek.....		1,000	Sunshine, Abrams Creek.....		5,000
Custer, Doll's pond.....		500	Tallassee, Cheowee Creek.....		4,000
French Creek.....		3,600	Unicoi, Birch Log Creek.....		10,000
Deerfield, Horse Thief Creek.....		1,000	Indian Creek.....		500
Elmore, Wildcat Creek.....		500	Wetmore, Harrison Creek.....		4,000
Englewood, Whitewood Creek.....		1,000	Williams Creek.....		4,000
Fruitdale, Stearns's pond.....		500	Utah:		
Hermosa, Battle Creek.....		2,000	Cooperton, Dry Fork Creek Ponds.....		250
Hill City, Horse Creek.....		2,000	Milford, Meadow Springs Pond.....		250
Newton Fork Creek.....		2,000	Salt Lake City, Kesler Farm Pond.....		250
Slate Creek.....		4,500	Vermont:		
Spring Creek and branches.....		19,000	Edgewater, Niggerhead Pond.....		4,000
Sunday Gulch Creek.....		1,000	Marshfield, Winooski River.....		3,000
Hot Springs, Beaver Creek.....		4,200			
Iron Creek, Spearfish Creek.....		500			
Jordan, Rosedale Lake.....		525			
Martin, Lake Creek.....		2,100			
Meckling, Wold's pond.....		1,000			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Vermont—Continued.			Washington—Continued.		
Randolph, White River, Middle Branch		6,000	Napa vine, Onalaska Lake		6,000
Saint Johnsbury, Sleepers River	10,000		Northport, Deep Creek		2,000
Waterbury, Meeting House Brook		5,000	Deep Creek Lake		1,000
Thatcher Brook		5,000	Nigger Creek		2,000
Virginia:			Onion Creek		2,000
Abingdon, Big Spring Pond		1,000	Pepon Lake		1,000
Appomattox, Appomattox River, South Branch		5,000	Republic, Fairy Lake		2,000
Arrington, Cody Creek		300	Sprague, Lake Colville		5,000
Buchanan, Beaverdam Run		300	Vancouver, Little Washougal River	* 100,000	
Bylesby, Brushy Creek		12,600	Lewis River, East Fork		4,000
Cascade, Cascade Creek		300	Washougal River		3,000
Catawba, Catawba Creek, North Branch		3,000	Wilbur, Lake McGinnis		2,500
Covington, Blue Spring Run		300	West Virginia:		
Falling Springs Branch		300	Albright, Dougherty Creek		3,500
Roaring Run		150	Muddy Creek		3,500
Eggleston, Sinking Creek		600	Beard, Locust Creek		3,400
Elkton, Naked Creek and tributaries		1,250	Bismark, Difficult Creek		8,000
Faber, Barrett Pond		200	Burdette Creek, Meadow River		1,000
Bear Branch		2,000	Jenningson, Laurel Fork Creek		12,000
Green Cove, White Top Creek		70,000	Martinsburg, Baker Lake		3,000
Hollins, Carvens Creek		10,000	Midvale, Long Run		450
Horse Pen Branch		10,000	Mullens, Mullens Pond		1,000
Hot Springs, Cowardin Run		300	Petersburg, Potomac River, South Branch		10,000
Hunters, Snake Den Creek	10,000		Renick, Droop Pond		400
Limestone, Gooney Creek		600	Rowlesburg, Wolf Creek		3,000
Luray, Chrisman Hollow Creek		500	Sweet Springs, Sweet Springs Creek		5,000
Hudson Creek		1,000	Ten Mile, Snyder's pond		200
Yagar Pond		500	Terra Alta, Browning's pond		2,000
Maggie, Johns Creek, Mountain Branch		300	Joes Run, tributary of White Oak Run		1,000
Mechums River, Moorman River		5,000	Wisconsin:		
Monterey, South Strait Creek		5,200	Antigo, Kennedy Creek		700
Pembroke, Little Stony Creek		600	Spring Creek		700
Penn Laird, Mill Creek		4,000	Thompson Lake		350
Ripplemead, Big Stony Creek		450	Arcadia, Beaver Creek		350
Roanoke, Tinker Creek		2,000	Elk Creek, North Branch		350
Rural Retreat, Cripple Creek		2,500	Elk Creek, South Branch		350
Shenandoah, Naked Creek		1,000	Glencoe Creek, North Branch		350
Washington:			Glencoe Creek, West Branch		350
Aberdeen, Delazine Creek		2,000	Irish Valley Creek		350
East Hoquiam River		2,000	Lewis Valley Creek		350
Johns River		3,000	North Creek		350
Little North River		3,500	Tamarack Creek		350
Stevens Lake		1,000	Ashland, Fish Creek		3,000
Wishkah River		3,500	Onion River		2,000
Chevelah, Platt's pond		2,000	Sioux River		2,000
Colville (applicant)	* 101,000		Siskowit River		2,000
Everett (applicant)	* 100,000		Athens, Black Creek		1,050
Naches, Johncox's pond		3,000	Augusta, Browns Creek		1,000
			Coon Gut Creek		1,000
			Thompson Creek		2,000
			Barneveld, Bruners Creek		1,000
			Macks Trout Creek		1,000
			Mickelson Creek		1,000
			Moyer Creek		1,000
			Park River		1,000
			Trainer Creek		1,000
			West Blue Mounds Creek		2,000

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			Wisconsin—Continued.		
Black River Falls, Squaw Creek Pond.		470	Mosinee, Four Mile Creek.		700
Blue Mounds, Boley Creek.		1,000	Hog Creek.		700
Dolonty Creek.		1,000	Oconomowoc, Battle Creek.		2,000
McKinley Creek.		1,000	Robinson Creek.		2,000
Rusti Creek.		1,000	Waterville Creek.		2,000
Topper Creek.		1,000	Ontonagon, Union River.		2,000
Cable, Namakagon River.		2,000	Otis, Berry Creek.		2,000
Colfax, Eighteen Mile Creek.		500	Dunfield Creek.		2,000
Haughly Creek.		500	Garrison Creek.		2,000
Larsen Creek.		500	Hays Creek.		2,000
Dodgeville, Johnstown Creek.		2,000	Kane Creek.		2,000
Smiths Pond.		1,000	Kelly Creek.		2,000
Dousman, Scuppernong Creek.		1,000	Park Falls, Horseshoe Creek.		2,000
Eau Claire, Big Rock Creek.		1,000	Scott Creek.		2,000
Coon Creek.		1,000	Parrish, Pine Creek.		500
Little Rock Creek.		1,000	Prairie River.		1,000
Michel Creek.		1,000	Silver Creek.		500
West Creek.		1,000	Phelps, Alvo River.		700
Elmwood, Big Missouri Creek.		700	Hay Meadows Creek.		700
Galena, Hinz Creek.		2,000	Pound, North Beaver Creek.		350
Glen Flora, Main Creek, North Fork.		700	South Beaver Creek.		350
Hawkins, Burgess Creek.		2,000	Rhineland, Goodegast Creek.		1,000
McDermitt Creek.		2,000	Hardells Creek.		1,000
Main Creek.		2,000	Jenne Weber Creek.		1,000
Meadow Creek.		2,000	Lake Creek.		1,000
Pine Creek.		2,000	Noisy Creek.		1,000
Hayward, Namakagon River.		2,000	Pine Creek.		1,000
Hudson, Greenes Creek.		350	Prairie River.		1,400
Jefferson Creek.		700	Skunk Creek.		1,000
Willow River, tributary of.		350	Rice Lake, Big Bear Creek.		1,000
Hurley, Fifield Creek.		1,000	Cobb Creek.		1,000
Go Go Gashim River.		2,000	Hickey Creek.		1,000
Younger Creek.		1,000	Menominee River.		2,000
La Cross, Adams Valley Creek.		2,000	Red Cedar River.		2,000
Beaver Creek.		2,000	Yellow River.		1,000
Bostwick Valley Creek.		2,000	Richland Center, Ash Creek.		2,000
Dutch Creek.		3,000	Big Willow Creek.		2,000
Flemings Creek.		2,000	Big Willow Creek, Mickle Branch.		1,000
Halfway Creek.		3,600	Byrds Creek.		2,000
Lewis Valley Creek.		2,000	Sawyer Creek.		2,000
Mormon Cooley Creek.		4,400	Sauk City, Denzer Creek.		1,000
Sand Creek.		2,000	Honey Creek.		2,000
Sand Lake Cooley Creek.		2,000	Honey Creek, tributary of.		3,000
Timber Cooley Creek.		2,000	Otter Creek.		2,000
Ladysmith, Little Weirgo Creek.		3,000	Sugar Grove Creek.		1,000
Manitowoc, Manitowoc River.		500	White Mound Creek.		1,000
Michicott River.		500	Saxon, Potatoe River.		3,000
West Twin River.		500	Vaughn Creek.		3,000
Merrillan, Arnold Creek.		230	Sheboygan, Spring Farm Creek.		500
Cisna Creek.		230	Sparta, Bailey Creek.		1,000
Downy Creek.		230	Beaver Creek.		1,000
Farka Creek.		230	Big Creek.		1,000
Halls Creek.		230	Brackett Creek.		1,000
Halls Creek, West Branch.		230	Clear Creek.		1,000
Hammond Creek.		230	La Crosse River.		5,600
Hunters Creek.		230	La Crosse River, North Fork.		3,600
Olsons Creek.		230	La Crosse River, South Fork.		1,800
Oakwood Pond.		230	Little Silon Creek.		1,000
Visno Creek.		230	Prescott Creek.		1,000
Millston, Glens Creek.		1,000	Rockwell Creek.		1,000
Wymine Creek.		2,000	Sargent Creek.		1,000
			Schlytter Creek.		1,000
			Shattuck Creek.		1,000

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## RAINBOW TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			Wisconsin—Continued.		
Sparta, Sias Creek.....		1,000	Wausau, Big Trap Creek.....		1,000
Silon Creek.....		2,000	Plover River.....		1,000
Silver Creek.....		1,600	Wautoma, Alder Creek.....		500
Smith Creek.....		1,000	Birch Creek.....		1,000
Soper Creek.....		1,800	Weirgor, Weirgor River.....		2,000
Sparta Creek.....		1,000	Wheeler, Big Beaver Creek.....		700
Swamp Creek.....		1,000	Moe Creek.....		350
Walworth Creek.....		1,000	Wilton, Cook Creek.....		2,000
West Creek.....		1,000	Moore's Creek.....		2,000
Tomahawk, Avery Creek.....		2,000	Wyoming:		
Bearskin Creek.....		2,000	Aladdin, Pearson's pond.....		500
Champine Creek.....		1,000	Benlah, Williams's pond.....		800
Little Somo River.....		2,000	Wilson Pond.....		500
Noisy Creek.....		2,000	Dubois, Lava Creek.....		1,000
Spirit River.....		2,000	Sheridan Creek.....		2,000
Spirit River, North Branch.....		2,000	Warm Spring Creek.....		3,000
Spring Creek.....		2,000	Encampment, Encampment River.....		400
Trout Creek.....		1,000	Evanston, Bear River.....		22,500
Trempealeau, Fox Creek.....		3,000	Lander, Beaver Creek.....		2,000
Holcomb Cooley Creek.....		3,000	Nipper Lake.....		1,000
Pine Creek.....		3,000	Pogo Agie River, North Fork.....		2,000
Tamarack Creek.....		3,000	Lusk, Rawhide Creek.....		1,500
Upson, Erickson Creek.....		1,000	Sheridan, Owl Creek, upper forks of.....	*106,000	
Potatoe River, North Branch.....		3,000	Story, State fish commission.....	*100,000	
Warrens, First Creek.....		3,000	Portugal: Lisbon, Government of Portugal.....	*50,000	
Waukesha, Wrights Creek, tributary of.....		1,000			
Waupaca, Chain of Lakes.....		5,000			
Wausau, Big Sandy Creek.....		1,000	Total <sup>b</sup> .....	{ 243,800 *1,489,900 }	2,831,747

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry. <sup>b</sup> Lost in transit, 25,140 fingerlings.

## ATLANTIC SALMON.

Disposition.	Fry.
Maine: East Orland, Penobscot River, East Branch.....	1,709,815

## LANDLOCKED SALMON.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Maine:			Maine—Continued.		
Abbott Village, Sebec Lake.....	8,000		Farmington, Varnum Pond.....		1,350
Bath, Wattuh Lake.....	3,000		Grand Lake Stream, Dobois Lake.....	14,168	15,000
Bingham, Rowe Pond.....	4,000		Grand Lake.....	105,000	52,730
Blanchard, Little Bunker Pond.....	2,000		Green Lake, Green Lake Harrington, Schoodic Lake.....	15,000	
Bucksport, Toddy Pond.....	8,000		Houlton, Drew Lake.....	5,000	
Caribou, State fish commission.....	*200,000		Jackman, Lake Wood.....	6,000	
Dedham, Manns Brook.....		15,000	Kineo, Moose River.....	16,000	
Dexter, Lake Wassookeag.....	8,000		Moosehead Lake.....	8,000	
Enfield, Cold Stream Lake.....	6,000		Roach River.....	8,000	
Farmington, Clear Water Lake.....	11,000		Nicolin, Nicolin Lake.....	6,000	
			North Windham, State fish commission.....	10,000	
				*100,000	

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LANDLOCKED SALMON—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
<b>Maine—Continued.</b>			<b>New Jersey:</b>		
Onawa, Middy Pond..	2,000		Hacketstown, State fish commission....	*10,000	
Otis, Green Lake.....	25,000	11,540	<b>New York:</b>		
Patten, Lower Shin Pond.....	6,000		Arden, Forest Lake.....	*10,000	
Princeton, Farrow Lake.	5,000		Lake George, Lake George.....		600
Rockland, Chickawakee Lake.....	4,000		Long Lake West, Doctors Pond.....	*5,000	
Seal Harbor, Jordan Pond.....	5,000		East Charley Pond.....	1,000	
South Paris, Abbott Pond.....	4,000		Little Otter Pond.....	1,000	
Hall Pond.....	4,000		Lily Pad Pond.....	1,000	
Virginia Lake.....		16	Otter Pond.....	*5,000	
Waterville, Britton Lake.....	6,000		New York, Aquarium	*1,000	
Wescott, Little Ossipee Lake.....	8,000		Port Jervis, Bauer Lake	1,000	
West Paris, Concord Pond.....	4,000		Big Pond.....	1,000	
<b>Massachusetts:</b>			Choontie Lake.....		400
Falmouth, Fresh Pond.	3,000		Raquette Lake, Lake Kora.....	*5,000	
Jenkins Pond.....	3,000		Syracuse, Skaneateles Lake.....	2,000	
Mares Pond.....	3,000		Thurman, State fish commission.....	*25,000	
Still River, Brookfield Lake.....		1,000	<b>North Carolina:</b> Lake Toxaway, Fairfield Lake	4,800	
Hell Pond.....		1,000	<b>Vermont:</b>		
West Barnstable, Michael Lake.....		1,000	Greensboro, Caspian Lake.....		701
<b>Michigan:</b> Sault Ste. Marie, State fish commission.....	*25,000		Hardwick, Nichols Pond		390
<b>Minnesota:</b> St. Paul, State fish commission.....	*25,000		Island Pond, Seymore Lake.....		700
<b>New Hampshire:</b>			Middlebury, Lake Dunmore.....		800
Bartlett, Sawyer Pond..	3,000		Norton Mills, Little Averill Lake.....		700
Bristol, Newfound Lake	6,000		Big Averill Lake.....		700
Canaan, Tewksbury Pond.....	3,000		Orleans, Long Pond.....		800
Lebanon, Crystal Lake.	3,000		Roxbury, State fish commission.....	*50,000	
Nashua, Nashua River.	4,000				
Potter Place, Pleasant Lake.....	2,000				
Warren, State fish commission.....	*25,000		<b>Total</b> <sup>b</sup> .....	{ 357,968 *486,000 }	105,777

<sup>a</sup> Eggs indicated by an asterisk, thus (\*); all others are fry.<sup>b</sup> Lost in transit, 10,000 fry.

## SCOTCH SEA TROUT.

Disposition.	Adults.
<b>Maine:</b> East Orland, Alamoosook Lake.....	509

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BLACKSPOTTED TROUT.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings.
Colorado:			Colorado—Continued.		
Alamosa, Miners Creek.....		10,000	Idaho Springs, Fall		
Rio Grande River.....		14,000	River.....		10,000
Antero, Antero Reservoir.....		24,000	Lake Edith.....		15,000
Aspen, Maroon Lake.....		14,000	Insmont, South Platte		
Roaring Fork River, Upper.....		30,000	River.....		10,000
Snow Mass Creek.....		14,000	Ivanhoe, Ivanhoe Creek.....		4,500
Biglow, Frying Pan River, North Fork.....		4,500	Lyle Creek.....		4,500
Breckenridge, Crystal Lake.....		14,000	Leadville, Big Union Creek.....		10,000
Bryn Mawr, South Platte River.....		10,000	Empire Creek.....		10,000
Buena Vista, Harvard Creek.....		14,000	Frying Pan River.....		9,000
North Cottonwood Creek.....		20,000	Los Pinos, Webb Lake.....		10,000
South Cottonwood Creek.....		20,000	Marble, Beaver Ponds.....		10,000
Buffalo, Buffalo Creek.....		10,000	Carbonate Creek.....		10,000
Busk, Windsor Lake.....		40,000	Crystal River, headwaters.....		24,000
Cardinal, Barker Lake.....		48,000	Moffat, California Gulch Creek.....		10,000
North Boulder Creek, headwaters.....		20,000	Saguache Park Lake.....		4,000
Cebolla, East Elk Creek.....		20,000	Saguache River.....		4,000
Cliff, Deer Creek.....		20,000	Sheep Creek.....		10,000
Corona, Corona Lake.....		10,000	Nast, Chapman Lake.....		16,000
Creede, Rio Grande River.....		30,000	Frying Pan River.....		20,500
Delta, Bear Creek.....		10,000	Frying Pan River, South Fork.....		4,500
Happy Hollow Creek.....		4,000	Pagosa Springs, Big Navajo River.....		20,000
Denver, State fish commission.....	*160,000		Little Navajo River.....		14,000
Dillon, Boulder Creek.....		14,000	Piedra River, East Fork.....		14,000
Rock Creek.....		14,000	San Juan River, East Fork.....		14,000
Upper Cataract Lake.....		10,000	Turkey Creek.....		14,000
Durango, Canyon Creek.....		9,500	Weminuche Creek and tributaries.....		52,000
Florida River.....		19,000	Williams Creek.....		20,000
Junction Creek.....		19,000	Pando, Eagle River.....		30,000
La Plata River.....		19,000	Parshall Williams Creek, South Fork.....		14,000
Lightner Creek.....		19,000	Williams Fork River.....		20,000
Mancos River, East and West Forks.....		19,000	Pine Grove, Pine Creek.....		10,000
Mill Creek.....		9,500	Rollinsville, Middle Boulder Lake.....		24,000
Piedra River.....		19,000	Rosemont, East Beaver Creek.....		14,000
Pine River.....		19,000	Saderland, Gould Creek.....		14,000
Vallecito River.....		12,600	Silverton, Molas Lake.....		22,000
Eldora, Boulder Creek.....		40,000	South Mineral Creek.....		8,000
Estabrook, Craig Creek.....		20,000	Singleton, South Platte River.....		10,000
Fairplay, Pennsylvania Creek.....		14,000	Snow Mass, Capitol Creek.....		14,000
Rich Creek.....		10,000	Sulphur Springs, Corral Creek.....		10,000
Sacramento Creek.....		14,000	Willow Creek.....		10,000
Tumbling Creek.....		10,000	Thomasville, Engelbrechts Lakes.....		120,000
Florissant, South Platte River.....		20,000	Walden, Kelley Lake.....		7,500
Foxton, South Platte River.....		10,000	Lake Agnes.....		7,500
Fraser, Ranch Creek.....		10,000	Idaho:		
Granby, Fraser River.....		20,000	Enaville, Coeur d'Alene River, North Fork.....	10,000	
Grand River, North Fork.....		20,000	Pine Creek.....	2,000	
Grand River, South Fork.....		4,000	St. Joe River.....	4,000	
Indian Creek.....		10,000	Mountain Home, Fall Creek.....	6,000	
Strawberry Creek.....		4,000	Lime Creek.....	4,000	
Supply Creek.....		10,000	Rathdrum, Chilco Creek.....	4,000	
Grand Junction, East Creek.....		10,000	Salmon, Wakapa Lake.....	4,000	
Kannah Creek.....		20,000	Wallace, Big Creek.....	2,000	
Grant, Geneva Creek.....		20,000	Placer Creek.....	2,000	
Gunnison, Gunnison River.....		50,000	Slate Creek.....	2,000	
Gypsum, Sweetwater Lake.....		50,000	Michigan: Detroit, State fish commission.....	*10,000	

<sup>a</sup> Eggs are indicated by an asterisk (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BLACKSPOTTED TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Finger-lings.	Disposition.	Fry and eggs. <sup>a</sup>	Finger-lings.
Montana:			Montana—Continued.		
Anaconda, California Creek.....	2,000		Glacier Park, Altyn Lake.....	2,000	
Cobb Creek.....	2,000		Gunsight Lake.....	2,000	
Deep Creek.....	4,000		Upper St. Marys Lake.....	4,000	
Dempsey Creek.....	2,000		Gold Creek, Gold Creek.....	2,000	
Dutchman Creek.....	4,000		Gregory, Casey Creek.....		
Fish Trap Creek.....	4,000		Ponds.....	2,000	
Foster Creek.....	4,000		Heron, Elk Creek.....	2,000	
La Marsh Creek.....	4,000		Elk Creek, East Fork.....	2,000	
Lost Creek.....	4,000		Huson, Nine Mile Creek.....	4,000	
Mill Creek.....	2,000		Iron Mountain, Cedar Creek.....	4,000	
Race Track Creek.....	2,000		Deep Creek.....	2,000	
Seymour Creek.....	2,000		Dry Creek.....	4,000	
State fish commission.....	*200,000		Fish Creek.....	2,000	
Warm Spring Creek.....	2,000		Flat Creek.....	2,000	
Willow Creek.....	2,000		Fourteen Mile Creek.....	4,000	
Arlee, Jocko River.....	2,000		Johnston Creek.....	2,000	
Avon, Nevada Creek.....	4,000		Lost Gulch Creek.....	2,000	
Belton, Avalanche Lake.....	2,000		Oregon Gulch Creek.....	2,000	
Bowman Lake.....	4,000		Quartz Creek.....	2,000	
Lake McDonald.....	4,000		Thompson Creek.....	2,000	
Logan Lake.....	2,000		Trout Creek.....	6,000	
McDermott Lake.....	2,000		Josephine, Sixteen Mile Creek.....	12,000	
Reynolds Lake.....	2,000		Leonia, Pine Creek.....	2,000	
Bigtimber, Boulder Creek, Upper.....	6,000		Libby, Cedar Creek.....	2,000	
Boulder Creek, West Branch.....	6,000		Fisher River.....	4,000	
Deer Creek, Lower.....	6,000		Quartz Creek.....	2,000	
Deer Creek, Upper.....	12,500		Lima, Big Sheep Creek.....	8,000	
Blossburg, Dog Creek.....	4,000		Lewistown, Beaver Creek.....	6,000	
Uncle George Creek.....	2,000		Livingston, Bloom Lake.....	4,500	
Bozeman, Asbestos Creek.....	5,000		Cokedale Creek.....	4,500	
South Dry Creek.....	5,000		Elbow Creek.....	4,500	
Butte (applicant).....	*200,000		Ferry Creek.....	4,500	
Chadbourne, Bangtail Creek.....	8,000		Mission Creek.....	6,000	
Clyde Park, Brackett Creek.....	10,000		Strickland Creek.....	4,500	
Canyon Creek.....	8,000		Upper Mission Creek.....	4,500	
Cole Creek.....	8,000		West Boulder River.....	4,500	
Cottonwood Creek.....	10,000		Yellowstone River.....	6,000	
Rock Creek.....	10,000		Yellowstone River, Lower.....	6,000	
Shields River.....	14,000		Yellowstone River, Upper.....	6,000	
Columbus, Rosebud River, East and West Forks.....	9,000		Lodge Grass, Lodge Grass Creek.....		16,500
Corwin Springs, Cedar Creek.....	4,000		Soap Creek.....		15,000
Daileys, Daileys Creek.....	8,000		Logan, Rea Creek.....	4,000	
Deer Lodge, Cottonwood Creek.....	2,000		Lombard, Sixteen Mile Creek.....	12,000	
Nevill's pond.....	2,000		Manhattan, Bull Creek.....	12,000	
Dell, Cabin Creek.....	8,000		Camp Creek.....	12,000	
Dixon, Jocko Creek.....	2,000		Spring Creek.....	6,000	
Elliston, Telegraph Creek.....	2,000		Martinsdale, Mill Creek.....	8,000	
Emigrant, Simon Creek.....	10,000		Mussellshell River, North Fork.....	12,000	
Forest Grove, Flatwillow Creek, North Fork.....	2,000		Mussellshell River, South Fork.....	4,000	
Flatwillow Creek, South Fork.....	2,000		Whitetail Creek.....	8,000	
McCartney Creek.....	2,000		Maudlow, Sixteen Mile Creek.....	12,000	
Porter Creek.....	2,000		Miner, Mill Creek, North Fork.....	8,000	
Garrison, Rock Creek.....	2,000		Rock Creek, Upper.....	8,000	
Willow Creek.....	2,000		Missoula, Bitter Root River.....	4,000	
Geyser, Arrow Creek.....	2,000		Carlton Lake.....	2,000	
McCarthy Creek.....	2,000		Lo Lo Creek.....	4,000	
Gilman, Elk Creek.....	2,000		Miller Creek.....	2,000	
Ford Creek.....	2,000		O'Brien Creek.....	2,000	
Smith Creek.....	2,000		Rattlesnake Creek.....	4,000	
Willow Creek.....	2,000		Rodgers Creek.....	2,000	
			Perma, Lee's lake.....	2,000	

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BLACKSPOTTED TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Finger-lings.	Disposition.	Fry and eggs. <sup>a</sup>	Finger-lings.
<b>Montana—Continued.</b>			<b>New York:</b>		
Pony, Mason Lake.....	2,000		New York City, Aquarium.....	*25,000	
Pray, Mill Creek.....	12,500		<b>Oregon:</b>		
Mill Creek, South Fork.....	10,000		Bonneville, State fish commission.....	*200,000	
Strawberry Creek.....	12,500		Rogue River, Butte Creek.....		5,188
Ravalli, Jocko Creek.....	2,000		Rogue River, North Fork.....		15,750
Red Lodge, Lake Scott.....	6,000		<b>South Dakota:</b>		
Rock Creek.....	7,500		Bellefourche, Smiley's pond.....		1,500
Rocky Fork Creek.....	9,000		Berne, Pettitt's pond.....		3,000
Ringling, Sheep Creek.....	4,000		Beulah, Sand Creek.....		15,000
Rock Hill, Harrison Lake.....	2,000		Dark Canyon, Lockhart's pond.....		5,000
Saltese, St. Regis River.....	2,000		Fairburn, French Creek.....		3,750
Sidney, Second Hay Creek.....	4,000		Hill City, Spring Creek.....		30,000
Springdale, Duck Creek.....	4,500		Hot Springs, Beaver Creek.....		1,500
Mendenhall Creek.....	4,500		Imlay, Morse Lake.....		3,000
Yellowstone River.....	7,500		Iron Creek, Spearfish Creek.....		47,000
Stevensville, Bass Creek.....	6,000		Merritt, Riley's pond.....		5,000
South Burnt Fork Creek.....	4,000		Mystic, Little Rapid Creek.....		12,500
Sweet Grass, Price Lake.....	2,000		Nemo, Jim Creek.....		10,000
Toston, Dry Creek.....	6,000		South Box Elder Creek.....		10,000
Townsend, Boulder Creek.....	8,000		South State Barn Creek.....		4,000
North Creek.....	8,000		Pactola, Antlers Lake.....		2,500
Ray Creek.....	8,000		Sherman's pond.....		10,000
Troy, O'Brien Creek.....	2,000		Rapid City, Box Elder Creek.....		9,000
Twin Bridges, Big Hole River.....	8,000		Box Elder Creek, Lower.....		6,000
Cottonwood Ranch Creek.....	10,000		City Springs Creek.....		5,000
Valier, Dupuyer Creek.....	4,000		Electric Light Pond.....		5,000
Lena Lake.....	2,000		Fair Ground Lake.....		5,000
Sheep Creek.....	4,000		Holley's lake.....		5,000
Whitehall, Cottonwood Creek.....	4,000		Indian School Lake.....		5,000
Wilsall, Carroll Creek.....	6,000		Lime Creek.....		5,000
Daisy Dean Creek.....	12,000		Minnelusa Creek.....		1,500
Elk Creek, North Fork.....	8,000		Prairie Creek.....		4,500
Elk Creek, South Fork.....	8,000		Rapid Creek, Lower.....		15,000
Flathead Creek.....	10,000		Schambers Creek.....		5,000
Flathead Creek, South Fork.....	8,000		Scott's pond.....		1,500
Flathead Creek, West Fork.....	8,000		Spring Creek.....		9,000
Little Muddy Creek.....	6,000		Spring Creek, Lower.....		6,000
Porcupine Creek.....	8,000		Rochford, Klemens Creek.....		6,000
Shields River, South Fork.....	8,000		Little Rapid Creek, North Fork.....		10,000
Smith Creek.....	4,000		Rapid Creek.....		7,000
<b>New Mexico:</b>			Savoy, Spearfish Creek.....		12,000
Buckman, Rito de los Frijoles.....		15,000	Silver City, Bogus Jim Creek.....		7,500
Cimarron, Cimarron River and tributaries.....		14,280	Jim Creek.....		10,000
Domingo, Cochiti Canon.....		11,900	Nugget Creek.....		7,500
Embuda, Pueblo River.....		19,500	Victoria Creek.....		7,500
Santa Barbara River.....		19,500	Spearfish, Cress Creek.....		5,000
Glorietta, Holy Ghost Creek.....		8,330	Deep Creek.....		5,000
Pecos River.....		15,470	Lindley Spring Creek.....		2,000
Winsor Creek.....		8,330	Patalochi's pond.....		5,000
Las Vegas, Gallinas River.....		11,900	Squaw Creek.....		4,000
Rio Gallinas.....		8,330	<b>Washington:</b>		
Santa Fe, Santa Fe Creek.....		15,000	Birdsview, Grandy Creek.....	216,310	
Tres Piedras, Rio Vallecitos.....		21,000	Burlington, State fish commission.....	*216,000	
Ute Park, Red River.....		11,900	Colfax, Palouse River, North and South Forks.....	4,000	
Volcano Siding, Rio San Antonio.....		19,500			

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*): all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BLACKSPOTTED TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings.
Washington—Continued.			Wyoming—Continued.		
Colville, Lake Thomas.....	2,000		Pinedale, Boulder Creek.....		7,500
Darrington, Clear Creek.....	46,000		Cross Creek.....		6,666
Merritt, Lake Josephine.....	21,000		Divide Lake.....		15,000
Northport, Big Sheep Creek.....	2,000		Dream Lake.....		6,667
North Yakima, Bumping River.....	2,000		Fremont Lake.....		22,500
Rattlesnake Creek.....	4,000		Green River Lakes.....		16,500
Satus Creek.....	4,000		Heart Lake.....		6,667
Seattle, Morse Creek.....	29,000		Newfork Lake.....		16,500
Springhill Pond.....	3,000		Pole Creek Lakes.....		6,667
Spokane, State fish commission.....	*216,000		Timico Lake.....		6,666
Tacoma, Clarks Creek.....	15,000		Trappers Lake.....		6,667
Crater Lake.....	30,000		Sheridan, State fish commission.....	*200,000	
Vancouver, McMaster's pond.....	4,000		Sundance, South Miller Creek.....		6,000
Wyoming:			Wolf, Bear Creek.....		4,000
Beulah, Bonetti Spring Branch.....		5,000	Black Canyon Creek.....		4,000
Crystal Spring Pond.....		12,000	Black Mountain Creek.....		4,000
Dayton, Big Goose Creek, East Fork.....		4,000	Little Tongue River, South Fork.....		4,000
Big Goose Creek, West Fork.....		4,000	McLaughlin Creek.....		3,000
Bruce Creek.....		2,000	Red Canyon Creek.....		3,000
Cedar Creek.....		2,000	Saw Mill Creek.....		3,000
Little Goose Creek.....		4,000	Soldier Creek.....		8,000
Mohawk Creek.....		3,000	Walker Creek.....		8,000
Shell Creek.....		4,000	Wolf Creek.....		9,000
Willett Creek.....		3,000	Yellowstone, Clear Creek.....	40,000	
Encampment, Encampment River.....		9,000	Natural Bridge Creek.....	35,000	
Encampment River, North Fork.....		15,000	Pelican Creek.....	50,000	
			Yellowstone River.....	50,000	
			Total <sup>b</sup> .....	{ 1,370,310 *1,427,000 }	2,481,228

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.<sup>b</sup> Lost in transit, 11,000 fry and 15,400 fingerlings.

## LOCH LEVEN TROUT.

Disposition.	Fingerlings.	Disposition.	Fingerlings.
Minnesota: Rochester, Washspring Creek.....	700	South Dakota—Continued.	
South Dakota:		Rough Lock Creek.....	3,000
Elmore, Spearfish Creek.....	2,400	State Nursery Pond.....	30,000
Iron Creek, Spearfish Creek.....	1,400	Wyoming:	
Maurice, Spearfish Creek.....	6,000	Beulah, Crystal Springs Pond.....	5,000
Rapid City, Barker Pond.....	15,000	Sand Creek.....	20,000
Savoy, Anderson Pond.....	1,000	Silver Creek.....	10,000
Little Spearfish Creek.....	11,000	Total.....	105,500

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LAKE TROUT.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Colorado: Malta, Lower Twin Lake.....		25,000	Minnesota—Continued.		72,000
Maine:			Duluth, Lake Superior..		
Otis, Green Lake.....	14,637		Duluth, State fish commission.....	*100,000	
Wilton, Wilson Lake.....	20,000		French River, Lake Superior.....	100,000	
Winthrop, State fish commission.....	*50,000		Glenwood, State fish commission.....	*100,000	
Massachusetts:			Grace Harbor, Lake Superior.....	575,000	
Lee, Green Water Pond.....		1,000	Grand Marais, Lake Superior.....	1,000,000	
Laurel Lake.....		1,000	Grand Portage, Lake Superior.....	800,000	
Shaw Pond.....		1,000	Grand Rapids, Pockama Lake.....		20,000
Shirley, Fort Lake.....	12,000		Knife River, Lake Superior.....	600,000	
Michigan:			Standard Rock, Lake Superior.....	20,000	
Beaver Island, Lake Michigan.....	1,833,000		Sucker River, Lake Superior.....	100,000	
Belle Isle, Lake Superior	600,000		Susie Island, Lake Superior.....	600,000	
Big Rock Reef, Lake Michigan.....	800,000		Two Harbors, Lake Superior.....	50,000	
Charlevoix, Lake Michigan.....	2,825,000		New Hampshire:		
Crystal Falls, Tobin Lake.....		10,000	Bristol, Newfound Lake		2,000
Detour, Lake Huron.....	1,000,000		Colebrook, State fish commission.....	*50,000	
Escanaba, Lake Michigan.....	150,000		Enfield, Mascoma Lake		2,000
Fish Island, Lake Superior.....	2,000,000		Pike, Lake Tarleton.....		1,800
Fishermen's Home, Lake Superior.....	1,100,000		Warren, State fish commission.....	*50,000	
Hog Island, Lake Michigan.....	675,000		New York:		
Houghton, Keweenaw Bay.....	625,000		Brewster, Boyds Lake.....		900
Irishman Reef, Lake Michigan.....	675,000		Calf Island, Lake Ontario.....	350,000	
Iron River, Iron Lake.....		15,000	Charity Shoals, Lake Ontario.....	273,000	
Isle Royale, Lake Superior.....	600,000		Cold Brook, Ashokan Lake.....	15,000	
Lake Ann, Lake Ann.....		20,000	Cooperstown, Otsego Lake.....	13,500	
Long Point, Lake Superior.....	1,360,000		Fox Island, Lake Ontario.....	791,000	
Manistique, Lake Michigan.....	150,000		Galloo Island, Lake Ontario.....	546,000	
Marquette, Lake Superior.....	1,250,000		Grenadier Island, Lake Ontario.....	1,577,476	
Munising, Lake Superior.....	475,000		Grimshaw Bay, Lake Ontario.....	250,000	
Nile Mile Point, Lake Michigan.....	800,000		Hopewell Junction, Sylvan Lake.....	8,000	
North Point, Lake Huron.....	1,165,000		Long Lake West, Loon Pond.....	*50,000	
Northville, State fish commission.....	*3,000,000		North Creek, Thirteenth Lake.....	10,000	
Ontonagon, Lake Superior.....	625,000		Point Peninsula, Lake Ontario.....	350,000	
Rock Harbor, Lake Superior.....	240,000		Port Henry, Clear Pond.....	15,000	
Sault Ste. Marie, St. Marys River.....	200,000		Crowfoot Pond.....	15,000	
Scarecrow Island, Lake Huron.....	2,335,000		Port Jervis, Cahoonzie Lake.....	8,000	
Tobens Harbor, Lake Superior.....	960,000		Little Pond.....	8,000	
Washington Harbor, Lake Superior.....	1,200,000		Raquette Lake, Sagamore Lake.....	*50,000	
Whitefish Bay, Lake Superior.....	2,000,000		Riverside, Schroon Lake	20,000	
Witbeck, Sun Dog Lake		20,000	Stony Island, Lake Ontario.....	546,000	
Wrights Island, Lake Superior.....	480,000		Trout Hole, Lake Ontario.....	546,000	
Minnesota:			White Plains, Rye Lake		1,900
Beaver Bay, Lake Superior.....	230,000		Wilson Bay, Lake Ontario.....	224,710	
Bovey, Trout Lake.....		20,000			
Clearbrook, Deep Lake.....		10,000			

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LAKE TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Pennsylvania: Pleasant Mount, State fish commission.....	*100,000	.....	Vermont—Continued. Roxbury, State fish commission.....	*201,054	.....
South Dakota: Fruitdale, U. S. Reclamation Reservoir.....	.....	525	Wisconsin: Bayfield, State fish commission.....	*2,500,000	.....
Rapid City, Electric Light Pond.....	.....	8,000	Brule River, Lake Superior.....	300,000	.....
Fairground Lake.....	.....	8,000	Donaldson, Black Oak Lake.....	.....	20,000
Utah: Murray, State fish commission.....	*50,000	.....	Phelps, Long Lake.....	.....	4,000
Vermont: Barnet, Harveys Pond.....	.....	3,000	Port Wing, Lake Superior.....	300,000	.....
Fair Haven, Sunset Lake.....	.....	985	Sheboygan, State fish commission.....	*1,000,000	.....
Hardwick, Nichols Pond.....	.....	2,000	Wyoming: Laramie, State fish commission.....	*25,000	.....
Orleans, Willoughby Lake.....	3,000	4,990			
Pittsford, Lake Dunmore.....	.....	3,000	Total <sup>b</sup> .....	{36,414,323 *7,326,054}	278,100

## BROOK TROUT

Arizona: Holbrook, Black River.....	3,000	.....	Colorado—Continued. Buxton, Tomichi River.....	4,500	.....
Chevalon Canyon Creek.....	3,000	.....	Carbondale, Thompson Creek.....	3,000	.....
Little Colorado River.....	3,000	.....	Cardinal, Lake Nederland.....	50,000	.....
California: Baird, McCloud River.....	20,000	.....	Cascade, Cascade Creek.....	8,000	.....
Salt Creek.....	2,000	.....	Catamount Creek.....	2,000	.....
Monterey, Little Sur Creek.....	10,000	.....	MacLennan's pond.....	2,000	.....
San Francisco, La Honda Creek, Upper.....	.....	10,050	Cassells, South Platte River.....	8,000	.....
Truckee (applicant).....	*5,000	.....	Castles, Taylor Creek.....	1,500	.....
Colorado: Antero, Antero Lake.....	98,000	.....	Cather Springs, Little Fountain Creek.....	21,000	.....
South Platte River.....	16,000	.....	Cimarron, Cimarron Lake.....	2,000	.....
South Platte River, Lower.....	2,000	.....	Cimarron River.....	20,000	.....
South Platte River, Upper.....	4,000	.....	Shugart Lake.....	6,000	.....
Arkansas Junction, Frying Pan River and tributaries.....	16,000	.....	Van Place Lake.....	6,000	.....
Arrow, Williams Fork River.....	1,000	.....	Colona, Burro Creek.....	2,000	.....
Aspen, Castle Creek.....	4,000	.....	Colorado Springs, Cheyenne Creek, South Fork.....	3,000	.....
Difficult Creek.....	3,000	.....	Mesa Lakes.....	12,000	.....
East Maroon Creek.....	3,000	.....	Turkey Creek, headwaters.....	10,000	.....
Grizzly Creek.....	3,000	.....	Crede, Lower Clear Creek.....	24,750	.....
Austin, Lily Pad Lake.....	15,000	.....	Miners Creek.....	1,500	.....
Basalt, Cattle Creek.....	20,250	.....	Rio Grande River.....	25,500	.....
Kelly's lake.....	1,500	.....	Shallow Creek.....	1,500	.....
Biglow, Frying Pan River, North Fork.....	4,000	.....	Trout Creek.....	1,500	.....
Last Chance Creek.....	3,000	.....	Crested Bluff, Slate Creek.....	2,500	.....
Morman Creek.....	3,000	.....	Crossons, South Platte River.....	12,000	.....
Bilk Creek, Bilk Creek.....	15,000	.....	Del Norte, Los Pinos Creek, North Fork.....	20,250	.....
Black Hawk, Robins Lake.....	2,000	.....	Delta, Clear Water Lake.....	15,000	.....
Blue Bird Siding, Boulder Creek.....	4,500	.....	Deer Creek.....	10,000	.....
Boulder, Boulder Creek and tributaries.....	24,000	.....	Dirty George Creek.....	15,000	.....
Middle Boulder Creek.....	15,000	.....	Kiser Creek.....	16,000	.....
Brandon, Brandon Lake.....	1,600	.....	Leon Lake.....	6,000	.....
Buena Vista, State fish commission.....	1,500	.....	Milk Creek.....	10,000	.....
			Surface Creek.....	22,500	.....
			Tongue Creek.....	15,000	.....
			Twin Lakes.....	6,000	.....
			Ward Creek.....	31,000	.....
			Youngs Creek.....	10,000	.....

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry. <sup>b</sup> Lost in transit, 2,715 fingerlings.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
Colorado—Continued.			Colorado—Continued.		
Denver, Bear Creek.....		26,000	Mancos, East Mancos Creek.....		15,000
Bredwell Pond.....		1,000	Marble, Beaver Lake.....		15,000
Jefferson Park Ponds.....	*50,000	2,000	Crystal River.....		26,000
Troutdale Lake.....		25,000	Lily Lake.....		30,000
Dotsero, Gypsum Lake.....		16,000	Marshall, South Boulder Creek.....		2,000
Eagle, Brush Creek.....		36,000	Meredith, Jakeman Creek.....		5,000
Edwards, Beaver Creek.....		15,000	Minturn, Gore Creek.....		20,000
Eagle River.....		15,000	Piney Creek.....		5,000
Lake Creek.....		25,000	Two Elk Creek.....		10,000
Eldora, Middle Boulder Creek.....		15,000	Monte Vista, Upper Conejos River.....		30,000
Fall Creek, Fall Creek.....		15,000	Nast, Chapman Lake.....		6,000
Florence, Mile Creek.....		1,500	Frying Pan River.....		10,000
Florissant, South Platte River.....		8,000	Frying Pan River, North Fork.....		3,000
Fort Collins, Buckhorn Creek.....		3,000	Frying Pan River, South Fork.....		2,000
Peterson Lake.....		3,000	Ivanhoe Creek.....		5,000
Porter Creek.....		2,000	Norrie, Chapman Creek.....		3,000
Rawah Creek.....		2,000	Koch's lake.....		2,000
Stub Creek.....		2,000	Sawyer Lake.....		4,000
Georgetown, Sherwin Pond.....		5,000	Northgate, Big Government Creek.....		15,000
Glacier Lake, Glacier Lake.....		4,500	Oak Creek, Silver Creek.....		15,000
Glenwood Springs, Roaring Fork River.....		1,500	Palmer, Monument Creek, North Fork.....		3,000
Granby, Grand River.....		15,000	Monument Creek, South Fork.....		2,000
Grand River, South Fork.....		10,000	Parshall, Saunders Creek.....		20,250
Grand Junction, Kanah Creek, North Fork.....		2,000	Placerville, Saltada Creek.....		10,000
Lobe Creek.....		2,000	Red Cliff, Holy Cross Lake.....		20,000
West Creek.....		2,000	Notch Mountain Lake.....		15,000
West Creek, North Fork.....		2,000	Turkey Creek.....		15,000
Granite, Sayre Creek.....		15,000	Ridgeway, Dallas Creek.....		15,000
Twin Lakes.....		21,000	Rifle, Miller Creek.....		15,000
Grant, South Platte River.....		6,000	Rollinsville, South Boulder Creek.....		15,000
Grousemont, South Platte River.....		6,000	Ruedi, Rocky Fork Creek.....		5,000
Gunnison, Gunnison River.....		5,000	Smith Creek.....		5,000
Gypsum, Gypsum Creek.....		15,000	Saderland, Gould Creek.....		10,000
Idaho Springs, Chicago Creek, West Fork.....		2,000	Salida, Arkansas River and tributaries.....		30,000
Chris Lake.....		8,000	Little River.....		10,000
Lake Edith.....		10,600	Sapinero, Gunnison River.....		2,500
Sherwin Lake.....		6,000	Sargents, Gunnison River.....		10,000
Slader Lake.....		4,000	Tomichi River.....		9,000
Ivanhoe, Ivanhoe Lake.....		4,000	Shawnee, South Platte River.....		6,000
Lyle Creek.....		1,500	Silver Plume, Clear Creek, Middle Fork.....		2,000
Lyle Lake.....		4,500	Sloss, Frying Pan River.....		10,000
Morman Lake.....		4,500	South Platte, Turquoise Lake.....		70,000
Jefferson, Rock Creek.....		4,500	Steamboat Springs, Burgess Creek.....		15,000
Lake City, Lake Fork River.....		14,000	Mad Creek, North Fork.....		15,000
Lake San Christobol.....		12,000	Walton Creek Lake.....		15,000
Lake George, Tarryall Creek.....		4,000	Walton Creek, North Fork.....		15,000
Leadville, Arkansas River, Upper.....		24,000	Willow Creek.....		15,000
Half Moon Creek.....		15,000	Sunset, Four Mile Creek.....		6,000
Lake Creek, Lower.....		13,500	Tabernash, Crooked Creek.....		10,000
Lower Twin Lake.....		25,000	Pole Creek.....		10,000
Musgrove Lakes.....		393,000	Ranch Creek.....		14,000
Smith Lakes.....	40,000				
Tennessee Creek.....		16,000			
Turquoise Lake.....		88,000			
Twin Lakes Creek.....		20,000			
Twin Peak Pond.....		2,000			
Upper Twin Lake.....		15,000			
Maddox, South Platte River.....		22,000			

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
<b>Colorado—Continued.</b>			<b>Indiana—Continued.</b>		
Thomasville, Engelbrecht Lakes.....		303,000	Michigan City, Palmer Creek.....		2,000
Lima Creek.....		8,000	Valpariso, Clear Creek.....		5,000
Vanadium, Big Bear Creek.....		15,000	Iowa: Hesper, Bear Creek.....		1,500
Victor, East Beaver Creek.....		10,000	Maine:		
Skaguay Lake.....		10,000	Atlean, Crocker Pond.....		2,000
Woodland Park, Beaver Creek.....		2,500	Hatchery Brook.....		300
Fly Casting Club Lakes.....		2,500	Lost Pond.....		600
Hay Creek.....		2,500	Moose Pond.....		600
Meadow Creek.....		1,500	Thompson Brook.....		600
Northfield Lake.....		8,000	Toby Pond.....		600
Trout Creek.....		20,000	Williams Brook.....		400
West Creek.....		20,000	Auburn, State fish commission.....	* 100,000	
West Monument Creek.....		10,000	Augusta, Lake Cobbosseecontee.....		725
<b>Connecticut:</b>			Belfast, Great Farm Brook.....		300
Andover, Skungamaug River and tributaries.....		400	Biddeford, Boothby Brook.....		300
Bolton, Box Brook.....		200	Foxhall Brook.....		600
Canaan, Sages Ravine Brook.....	2,000		Hill Brook.....		300
Colchester, Eight Mile River.....		1,500	Lord Brook.....		600
East Hartford, Howe Brook.....		200	Ricker Brook.....		400
Hubbard Brook.....		200	Tapley Brook.....		500
Granby, North Mountain Brook.....		400	Bigelow, Mount Bigelow Pond.....		500
Salmon Brook.....		400	Bigelow, Spring Lake.....		800
Hartford, Oregon Pond.....	2,000		West Carry Pond.....		800
Norwich, Broad Brook.....	3,000		Bingham, Carry Pond.....		50,000
Choat Brook.....	2,000		Chase Pond.....		1,000
Simsbury, McLean's pond.....		2,000	Echo Pond.....		1,000
South Norwalk, Silver Mine River.....	2,000		Pleasant Pond.....		500
Waterbury, Mad River.....	3,000		Rowe Pond.....		64,800
Walnut Grove Brook.....	2,000		Blanchard, Lilly Pond.....		500
Weekeepeme Creek.....	3,000		Little Bunker Pond.....		500
Woodbury River.....	3,000		Boothbay Harbor, Adams Pond.....		400
Westchester, Pine Brook.....		200	Boston Ranch, Holeb Lake.....		2,000
<b>Delaware:</b>			Branch Pond, Branch Pond.....	50,000	
Houston, Brown Branch.....		300	Bucksport, Craig Pond.....		1,000
Fuller Brook.....		150	Rocky Pond.....		2,000
Wilmington, Burris Run.....		1,000	Toddy Pond.....		2,000
<b>Georgia:</b>			Columbia Falls, Pretty Pond.....		1,000
Mountain City, Silver Branch.....		800	Danforth, Grand Lake.....		1,000
Tallullah Falls, Bad Creek.....		3,600	Danville, Middle Range Pond.....		800
<b>Idaho:</b>			Dedham, Manns Brook.....	125,000	
Pocatello, Yandall Springs Creek.....		3,250	Phillips Lake.....	50,000	
Priest River, Spring Creek.....		500	Dennysville, Hobart Brook.....		500
Rathdrum, Chilco Lake.....		500	Dexter, Half Moon Pond.....		15,000
Salmon, Spring Lake.....		1,500	Howard Brook.....		6,000
Spencer, Indian Springs Creek.....		500	Moors Pond.....		15,000
<b>Illinois:</b>			Puffer Pond.....		15,500
Galena, Harveys Branch.....		3,200	Ripley Pond.....		500
Spring Grove, State fish commission.....	* 25,000	300	Weymouth Pond.....		15,000
<b>Indiana:</b>			East Orland, Craig Pond.....		32,410
Connersville, Lambert Brook.....		2,000	Gully Brook.....		8,400
Delphi, Bridge Creek.....		3,000	Patten Pond.....		15,000
			Rocky Pond.....		15,000
			Upper Toddy Pond.....		15,000
			Wardswell Brook.....		8,000
			Ellis Siding, Cathance Lake.....		600
			Ellsworth, Blunts Pond.....		600
			Branch Brook.....	50,000	
			Lower Patten Pond.....		500
			Beech Hill Pond.....		500
			Enfield, Trout Pond.....		15,400

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
<b>Maine—Continued.</b>			<b>Maine—Continued.</b>		
Farmington, streams along Maine Central Railroad.....		20,000	Jackson, Whipple Pond.....		12,000
Franklin, Guagus Pond.....		500	Wood Brook.....		12,500
Narraguagus River.....		800	Kineo, Carry Brook.....		30,600
Fryeburg, Basin Brook.....	8,000		Scoteau Brook.....		44,000
Chandler Brook.....	6,400		Kineo Station, Spencer Pond.....		1,500
Charles Brook.....	6,400		Machias, Bog Lake.....		1,200
Dock Brook.....	12,000		Northwest Pond, Northwest Pond.....		18,000
Elkins Brook.....	12,000		Oakland, Messalouskee Lake.....		2,000
Lake Keyar.....		3,500	Patten, Davis Pond.....	20,000	
Green Lake, Green Lake.....		3,000	Portland, Beaver Brook.....		8,000
Greenville, Roach River.....		1,500	Brandy Brook.....		12,000
Harmony, Grant Brook.....		10,000	Frank Brook.....		8,000
Holeb, Fish Pond Brook.....		400	Gully Brook.....		8,000
Howe Brook, Howe Brook.....		30,000	Little River, North Branch.....		12,000
Jackman, Attean Lake.....		30,000	Nonesuch River.....		26,000
Basset Pond.....		12,000	Piscataqua River.....		12,000
Beattie Pond.....		12,000	Red Brook.....		8,000
Benjamin Pond.....		12,000	Saco, Boothby Brook.....		8,000
Berry Pond.....		12,000	Foxwell Brook.....		12,000
Bickford Pond.....		12,000	Fresh Water Brook.....		14,000
Big Turner Pond.....		12,000	Harmon Brook.....		8,000
Bog Brook.....		6,000	Hill Brook.....		8,000
Bog Pond.....		12,000	Kimball Brook.....		12,000
Boulder Pond.....		12,000	Meade Brook.....		16,000
Campbell Pond.....		12,500	Running Brook.....		8,000
Clearwater Pond.....		10,000	Silley Brook.....		8,000
Crocker Pond.....		300	Tapley Brook.....		6,000
Damon Pond.....		300	Wyman Brook.....		8,000
Enchanted Lake.....		16,000	Schoodie Lake, Schoodie Lake.....		18,000
Fernold Pond.....		12,000	Searsport, Swan Lake.....		1,500
First Toby Pond.....		12,000	Shirley, Ordway Lake.....		40,000
Fish Pond.....		600	Skinner, Barrett Pond.....		400
Gander Brook.....		6,000	Bog Brook.....		400
Grace Pond.....		12,000	Deer Pond.....		200
Heald Brook.....		10,600	Indian Pond.....		200
Heald Pond.....		600	Lowell Pond.....		400
Horse Brook.....		8,000	Smith Brook, Smith Brook.....		15,000
Horse Shoe Pond.....		12,000	South Paris, Abbott Pond.....		800
Indian Pond.....		12,000	Concord River.....		1,000
Jim Mack Pond.....		300	Lake Pennesseewassee.....		600
Lake Parlin.....		16,000	Little Pennesseewassee Lake.....		500
Little Berry Pond.....		12,000	Marshall Pond.....		800
Little Big Wood Lake.....		20,000	Shagg Pond.....		800
Little Enchanted Pond.....		12,000	Twenty Mile Brook.....		1,375
Little Long Pond.....		12,000	Washburn Pond.....		800
Little Turner Pond.....		12,000	South Penobscot, Wights Pond.....		1,300
Little Wood Pond.....		12,000	Strong, Trout Lake.....		600
Long Pond.....		12,000	Waterville, Britton Lake.....		40,000
Lost Pond.....		12,000	West Ellsworth, Patten Pond.....	75,000	
Lowell Pond.....		12,000	Westfield, St. John River, Presque Isle Fork.....	30,000	
Lower Enchanted Pond.....		12,000	West Paris, Little Concord Pond.....		500
Moores Pond.....		12,000	<b>Maryland:</b>		
Moose River.....		31,000	Arcadia, Piney Run.....		900
Mud Pond.....		500	Baltimore, State fish commission.....	*50,000	
Newton Pond.....		12,300	Boring, McGills Run.....		2,000
Parlin Brook.....		8,000	Clear Spring, Big Spring Creek.....		150
Rache Pond.....		300	Frederick, Rock Creek.....		4,000
Rancourt Pond.....		300			
Sandy Brook.....		6,500			
Second Toby Pond.....		12,000			
Smith Pond.....		12,000			
Snake Pond.....		12,000			
Sply Pond.....		600			
Stony Brook.....		10,000			
Sugar Berth Pond.....		12,500			
Third Toby Pond.....		12,000			
Three Streams Brook.....		10,000			
Turner Pond.....		500			
Twin Island Pond.....		12,000			

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Maryland—Continued.			Massachusetts—Contd.		
Hagerstown, Bear Run.....		100	North Adams, Hudson Brook.....		250
Mountain Run.....		700	McMarana Brook.....		250
Spring Creek.....		700	Sherman Brook.....		125
Stakes Run.....		1,400	Northampton, Cable's pond.....		100
Lonaconing, Swamp Run.....		4,500	Rocky Hill Brook.....		300
Lutherville, Zynialani Falls Run.....		1,000	Westfield River, North Branch.....		600
Mountain Lake Park, Baker Run.....		1,500	North Wilbraham, Silver Street Pond.....		300
Broad Pond Creek.....		2,000	Palmer, Burleigh Brook Lake Goetting.....	2,000	400
Trout Run.....		1,500	Schneider Brook.....		100
Norrisville, Island Branch.....		1,000	Trout Brook.....		100
Oakland, Bear Creek, South Prong.....		3,000	Pittsfield, Clark Brook.....		200
Edgewood Pond.....		1,000	Fairfield Brook.....		600
Harrington Lake.....		1,500	Milton Brook.....		600
Hoyes Run.....		3,000	Sackett Brook.....		600
Roaring Creek.....		1,500	School House Brook.....		600
Toliver Run.....		1,500	Secum Brook.....	4,000	
White Meadow Run.....		200	Shaker Brook.....	200	300
Wilson Creek Lake.....		1,000	Town Brook.....		600
Ruxton, Poe's pond.....		1,000	Yokum River.....		600
Stony Run Station, Benson Branch.....		1,000	Shelburne Falls, Apple Valley Brook.....	2,000	
Westernport, Stony Run.....		1,000	Avery Brook.....		250
Massachusetts:			Bare River.....		250
East Pepperell, Gulf Brook.....	2,000		Branch Brook.....		250
Foxboro, Sunset Lake.....	4,000		Clark Brook.....		250
Graniteville, Morrison Brook.....		225	Drake Brook.....		250
Greenfield, Fiskes Pond.....		375	King Brook.....		250
Green River.....		375	Long Brook.....		250
Stone Brook.....		250	Murphy Brook.....		250
Holyoke, Barros Brook.....		200	North River.....		375
Crosby Brook.....		200	Saunders Brook.....		125
Spruce Corners Brook.....	2,000		Schneck Brook.....		125
Huntington, Westfield River, Middle Branch.....	4,000		Taylor Brook.....		250
Lancaster, Bowers Brook.....	2,000	200	Southbridge, Gibbs Brook.....		200
Burke Brook.....	2,000	200	Hammant Brook.....		200
Slate Rock Brook.....	2,000		Walker Brook.....		200
Spectacle Pond.....	4,000		South River, Poland Brook.....	4,000	
Lee, Beartown Brook.....		200	South River.....		400
Beartown Brook, East Branch.....	8,000		Still River, Little Hell Pond.....		200
Beartown Brook, West Branch.....	8,000		Topsfield, Brook Trail Pond.....		800
Clam River.....		200	Webster, Potter Brook.....	3,000	
East Lee Brook.....	8,000	200	West Brimfield, Quaboag River.....		300
Hop Brook.....	8,000	200	Williamsburg, Shaw Brook.....	3,500	
Muddy Brook.....		200	Westfield River, branch of.....	4,500	
Peggy Brook.....	8,000		Woods Hole, Hollyholm Trout Pond.....		500
Powder Mill Brook.....		200	Michigan:		
Tyringham Brook.....	8,000		Alpha, Mastodon Creek.....		1,500
Washington Mountain Brook.....	8,000	200	Au Sable, Elliott Creek.....	8,000	
Leominster Center, Wicopickee Brook.....		300	Pine River.....	25,000	
Monson, Conant Brook.....		300	Silver Creek.....	12,000	
New Bedford, Baker-ville Brook.....	1,000		Baldwin, Baldwin and Avery Creeks.....	20,000	
Bread and Cheese Brook.....			Balsam, Deer River.....		3,000
Destruction Brook.....	2,000		Baraga, Grandville Creek.....		2,000
Howland Brook.....	1,000		Sturgeon River.....		6,000
Lee Brook.....	1,000		Basswood, Paint River.....		6,000
Mouse Mill Brook.....	1,000		Bessemer, Black River.....		3,000
Shingle Island Brook.....	2,000		City Pond.....		1,500
			Meyers Creek.....		1,500
			Beulah, Platt River.....	25,000	

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Michigan—Continued.			Michigan—Continued.		
Birmingham, River			Lovells, Big Creek, East Branch		3,900
Rouge		2,700	Lucas, Clam River	5,000	
Bitely, Cedar Creek		3,000	Mandan, White Birch Creek		1,500
Black River, Black River and tributaries	12,000		Marenisco, Alder Creek		1,000
Branch, Weldon Creek	20,000		Balsam Creek		1,000
Brunswick, Cushman Creek		3,000	Barrs Creek		2,000
Caspain, Flanigan Creek		2,000	Bear Creek		2,000
Stocks Creek		2,000	Beaver Creek		2,000
Champion, Escanaba River, East Branch		1,500	Big Coon Creek		2,000
Escanaba River, Headwaters		3,000	Brady Creek		2,000
Charlevoix, Island Creek		2,000	Brit Creek		2,000
McGeagh Creek		2,000	Browne Creek		2,000
Monroe Creek		2,000	Brush Creek		1,000
Paddock Creek		2,000	Cedar Creek		1,000
Stovers Creek		2,000	Douglas Creek		2,000
Crystal Falls, Seven Springs Creek		1,500	Fisher Creek		2,000
Detroit, Meadow Brook		2,700	Forks Creek		1,000
Washtanaw Creek		1,200	Fosters Creek		2,000
Dryden, Belle River	30,000		Fox Creek		2,000
East Tawas, Silver Creek	8,000		Hazel Creek		2,000
Farwell, Littlefield Creek		8,000	Hoffman Creek		2,000
Medcott Lake	25,000		Honey Creek		2,000
Seven Creeks	5,000		Honeymoon Creek		1,000
Tobacco River and branches	45,000		Jones Creek		1,000
Gaylord, Au Sable River, North Branch			Kimbal Creek		2,000
Pigeon River	80,000		Little Coon Creek		2,000
Grayling, Au Sable River	90,000	13,000	Little Spring Creek		1,000
Hale, Smith Creek	8,000	3,900	McKinney Creek		2,000
Hancock, Johns Creek		2,000	Monroe Creek		2,000
Harrietta, Slagel River	15,000		Nine Mile Creek		2,000
Herman, Silver Creek		5,000	Pigeon Creek		2,000
Hillman, Cold Creek		3,600	Sampson Creek		2,000
Thunder Bay, tributaries of	8,000		Shammels Creek		2,000
Indian River, Little Pigeon River	12,000		Slippery Elm Creek		2,000
Iron Mountain, Merri-man Creek		3,000	Sutherland Creek		2,000
Iron River, McColman Creek		2,000	Triplett Creek		2,000
Morrison Creek		2,000	Weasel Creek		1,000
Ironwood, Montreal River		1,500	Willow Creek		2,000
Ishpeming, Alder Creek		2,000	Marquette, Whetstone Brook		1,500
Deer Creek		4,000	Mason, Raether Creek		2,000
Green Creek		2,000	Matchwood, Mersaw Creek		1,500
Sokoabeck Creek		2,000	Mayville, Hammelton Creek		2,000
Whitefish River, tributary of		2,000	Metropolitan, Sturgeon River, West Branch		5,000
Kalamazoo, Geyger Creek	8,000		Negaunee, Baldwin Kiln Lake		1,500
Kenton, Jumbo Creek		1,500	Birch Creek		1,500
Keweenaw Bay, Carp River		5,000	Nirvana, Marquette River and branches	20,000	
Lake Linden, MacCul-lonis Creek		4,000	Ontonagon, Bear Creek		2,000
Spring Creek		1,000	Big Iron Creek		4,000
Traverse River		7,000	Cranberry River		4,000
L'Anse, Carlson Creek		3,000	Deer Creek		4,000
			Duck Creek		5,000
			Little Iron Creek		4,000
			Mineral River		4,000
			Paddy Creek		2,000
			Second Creek		4,000
			Paynesville, Ontonagon River, Middle Branch		4,500
			Pellston, Maple River	100,000	
			Phoenix, Beaverdam Pond		1,000
			Bruneau River		3,500
			Garden City Pond		1,500
			Garden City River		5,000
			Old Cliff Meadow Pond		1,000

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
<b>Michigan—Continued.</b>			<b>Minnesota—Continued.</b>		
Phoenix, One Mile Farm Creek.....		1,500	Knife River, Knife River.....		3,000
Silver Creek.....		1,500	Manitou River.....		2,000
Randville, Solberg Creek.....		2,000	Schauff Lake.....		3,000
Rose City, Houghton Creek.....	12,000		Splitrock River.....		3,000
Roscommon, Au Sable River, South Branch.....		5,000	Sucker River.....		3,000
Ross Siding, Jackson Creek.....		1,500	Temperance River.....		3,000
Sagola, Sturgeon River, East Fork.....		8,000	Two Island Creek.....		3,000
Shelby, Piper Creek.....	8,000		Palmer, Knife River.....		4,000
Robinson Creek.....	10,000		Preston, Sugar Creek.....		1,050
Stony Creek.....	10,000		Trout Creek.....		1,050
Silverwood, Bear Creek.....		3,000	Rochester, Badger Creek.....		1,050
Hannah Creek.....		2,000	Brush Creek.....		1,050
Stager, Stager Creek.....		2,000	Bear Creek.....		700
Tawas City, Pickett Creek.....	8,000		Cascade Creek.....		1,750
Tobins Harbor, Tobins Harbor.....		8,000	Chester Creek.....		1,050
Toivola, Lake Eva.....		4,000	Dux Creek.....		700
Turtle, Ball Creek.....		1,500	Silver Creek.....		1,050
Kings Creek.....		1,500	Trout Creek.....		1,050
Wellington Tank, Jimmie Thomas Brook.....		1,500	Washspring Creek.....		2,250
Lemon Creek.....		1,500	Willow Creek.....		1,050
White Cloud, Big Cold Creek.....		3,000	St. Charles, Campbell branch.....		100
Wingleton, Bauman and Cedar Creeks.....	20,000		Carter Creek.....		100
Witbeck, Michigan Creek.....		3,000	Crow Creek.....		100
Wooster, Mint Creek.....	2,000		Drakes Spring Creek.....		100
<b>Minnesota:</b>			Hemmingway Creek.....		100
Caledonia, Pine Creek.....		2,000	Holtz Spring Creek.....		100
Chisholm, Sturgeon Branch.....		5,000	Logan Branch.....		100
Clearbrook, Clearbrook Creek.....	3,000		Pettis Creek.....		100
Duluth, Amity Creek.....		2,000	Pine Creek.....		100
Black Fox Creek.....		2,000	Quincy Creek.....		100
Eight Mile Creek.....		2,000	Troy Creek.....		100
Fisher Creek.....		3,500	Whitewater River, Middle Branch.....		100
Gooseberry River.....		5,000	Whitewater River, South Branch.....		100
Knife River.....		5,000	Simpson, Kinney Creek.....		1,050
Knife River, East Branch.....		3,500	Partridge Creek.....		1,050
Knife River, West Branch.....		5,000	Two Harbors, Encampment River.....		3,000
Lester River.....		5,000	Gooseberry River.....		4,000
Lester River, East Branch.....		3,000	Silver Creek.....		4,000
Miller Creek.....		4,000	Waldo, Big Stewart River.....		5,000
Silver Creek.....		3,500	Clear Creek.....		3,000
Storer Creek.....		3,000	Little Pine Creek.....		2,000
Sucker River, East Branch.....		4,000	Wanless, Spring Lake.....		2,000
Sucker River, West Branch.....		5,000	Winona, East Burns Valley Creek.....		4,500
Talmage River.....		3,500	Gilmore Creek.....		4,500
Tischer Creek.....		2,000	Pleasant Valley Creek.....		4,500
Harmony, Gregerson Creek.....		1,050	West Burns Valley Creek.....		4,500
Hoag Creek.....		1,050	<b>Montana:</b>		
Highland, Branards 43 Creek.....		2,000	Armstead, Wise River.....		450
Gooseberry River, branch of.....		4,000	Avon, Trout Creek.....		2,000
Knife River, Beaver Creek.....		2,000	Baker, Little Beaver Creek.....		750
Cross River.....		3,000	Bearmouth, Harvey Creek.....		2,000
Gooseberry Creek.....		3,000	Belgrade, Benhardt Creek.....		2,300
			Bull Run.....		2,000
			Cottonwood Creek.....		3,300
			Cowan Creek.....		2,300
			Dry Creek.....		4,300
			East Gallatin River.....		6,600
			Kennedy Creek.....		3,000
			Middle Creek.....		4,600
			Pass Creek.....		4,300
			Reese Creek.....		3,300
			Ross Creek.....		3,300

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Finger-lings, yearlings, and adults.	Disposition.	Fry and eggs.	Finger-lings, yearlings, and adults.
Montana—Continued.			Montana—Continued.		
Belgrade, Stony Creek.....		2,000	Bozeman, West Rain- bow Lake.....		1,500
Storey Creek.....		300	Wilson Creek.....		300
Thompson Creek.....		2,300	Browning, Cut Bank Creek, North Fork.....		3,500
Belton, Fish Creek.....		500	Cut Bank Creek, South Fork.....		3,500
Big Timber, Boulder River.....		1,200	Elk Creek.....		5,000
Deer Creek, Upper.....		1,750	Flatiron Creek.....		3,500
Sweet Grass Creek.....		1,000	Greasewood Creek.....		4,000
Bozeman, Adkjer Pond.....		3,000	Livermore Creek.....		5,000
Baker Creek.....		3,000	Milk River, South Fork.....		4,200
Beaver Creek.....		300	Willow Creek.....		3,500
Bostwick Creek.....		3,000	Buffalo, Buffalo Creek.....		500
Brackett Creek.....		300	Butte, Delmo Lake.....		2,500
Buck Creek.....		300	Carbella, Upper Rock Creek.....		7,000
Buffalo Horn Creek.....		300	Cardwell, South Boul- der River.....		1,750
Bulin Creek.....		2,000	Chadbourne, Willow Creek.....		1,500
Cache Creek.....		300	Choteau, Teton River.....		1,000
Camp Creek.....		4,000	Columbus, East Rose- bud River.....		1,750
Carlin Creek.....		1,000	Stillwater River.....		1,400
Cockrell Creek.....		1,000	Stillwater River, West Fork.....		1,750
Curtiss Creek.....		2,000	West Rosebud River.....		2,100
Dalley Creek.....		300	Corwin Springs, Cutlers Lake.....		500
Deer Creek.....		300	Harriett Lake.....		500
East Bear Creek.....		300	Crane, Sixteen Mile Creek.....		1,800
Fish Creek.....		2,000	Dailey's, Big Creek.....		1,250
Greek Creek.....		300	Deborgia, Big Creek.....		500
Heeb Creek.....		2,000	Deer Creek.....		1,500
Hell Roaring Creek.....		300	St. Regis River.....		9,500
Jackel Creek.....		2,000	Savanna Creek.....		500
Kennedy Creek.....		2,000	Twelve Mile Creek.....		5,500
Lansing Creek.....		2,000	Deer Lodge, Little Blackfoot River.....		1,000
Logger Creek.....		300	Little Rock Creek.....		600
Martin Creek.....		2,000	Peterson Creek.....		600
Meadow Creek.....		500	Race Track Creek.....		600
Middle Creek.....		300	Tin Cup Creek.....		600
Moose Creek.....		300	Dell, East Creek.....		1,750
Nixon Creek.....		4,000	Little Sheep Creek.....		2,100
North Cottonwood Creek.....		300	Red Rock Creek.....		2,800
North Dry Creek.....		300	Sage Creek.....		1,400
North Twin Lake.....		1,000	Simpson Creek.....		1,400
Odell Creek.....		1,000	Dillon, Beaverhead River.....		5,000
Olson Creek.....		300	Black Tare Creek.....		450
Ole Olson Lake.....		300	Divide, Divide Creek.....		300
Pasha Creek.....		2,000	Moose Creek.....		450
Pass Creek.....		300	Drummond, Douglass Creek.....		1,500
Porcupine Creek.....		300	Willow Creek, Upper.....		2,000
Reese Creek.....		300	Emigrant, Pine Creek.....		11,400
Rocky Creek.....		300	Trail Creek.....		11,400
Ross Creek.....		300	Florence, Three Mile Creek.....		1,200
Sage Creek.....		300	Forest Grove, Hell Creek.....		3,000
Sales Creek.....		300	Gardiner, Nez Perce Creek.....		15,000
Sales Lake.....		300	Glacier Park, Altyn Lake.....		3,500
Sixteen Mile Creek.....		450	Baring Creek.....		750
Smith Creek.....		2,000	Cataract Creek.....		750
Sour Dough Creek.....		300	Cut Bank Creek.....		25,750
South Cottonwood Creek.....		300	Grinnell Lake.....		3,500
South Meadow Creek.....		300	Josephine Lake.....		3,500
South Twin Lake.....		300	Midvale Creek.....		500
Spanish Creek.....		300			
Specimen Creek.....		300			
Squaw Creek.....		300			
Storey Creek.....		3,000			
Stuckey Creek.....		2,000			
Swan Creek.....		300			
Taylor Creek.....		1,000			
Thompson Creek.....		2,000			
Tice Creek.....		3,000			
Trail Creek.....		300			
West Fork, North Branch.....		300			
West Fork, South Branch.....		300			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
<b>Montana—Continued.</b>			<b>Montana—Continued.</b>		
Glacier Park, Red Eagle Creek.....		1,000	Roundup, Flatwillow Creek.....		1,000
Swift Current Creek, North Fork.....		750	Swimming Woman Creek.....		750
Two Medicine Lake.....		2,000	Willow Creek.....		750
Two Medicine River.....		1,000	St. Regis, Crystal Lake.....		1,250
Two Medicine River, Dry Fork.....		1,000	Sappington, Jefferson River.....		2,100
Glen, Willow Creek.....		450	Somers, State fish commission.....	* 50,000	
Hamilton, Bitter Root River.....		5,300	Spire Rock, Pipestone Creek.....		3,750
Bitter Root River, East Fork.....		300	Stanford, Surprise Creek.....		8,000
Bitter Root River, West Fork.....		300	Stevensville, Bass Creek.....		1,250
Blodgett Creek.....		300	Summit, Summit Lake.....		750
Lost Horse Creek.....		300	Twin Bridge, Big Hole River.....		3,000
Roaring Lion Creek.....		300	Valcour, Five Mile Creek.....		1,250
Rock Creek.....		300	Whitehall, White Tail Creek.....		1,050
Skalkaho Creek.....		300	White Sulphur Springs, Birch Creek.....		1,400
Sleeping Child Creek.....			Camas Creek.....		1,400
Homestake, Homestake Reservoir.....		3,000	Checkerboard Creek.....		1,400
Lewistown, Bear Creek.....		4,000	Musselshell River, North Fork.....		1,750
Castle Creek.....		500	Newlan Creek.....		1,750
Cottonwood Creek, Upper.....		2,000	Smith River, North Fork.....		1,400
Marcotte Creek.....		6,500	Wilsall, Coal Creek.....		1,000
Meadow Creek.....		750	Crandall Creek.....		1,000
Warm Spring Creek.....		500	Flathead River.....		2,000
Wolverine Creek.....		500	Horse Creek.....		1,500
Libby, Deep Creek.....		500	North Horse Creek.....		1,500
Flower Creek.....		500	Potter Creek.....		4,000
Lima, Beaverhead River.....		5,000	Wolf Creek, Dearborn Creek, South Fork.....		1,250
Livingston, Mortimer Creek.....		4,000	<b>New Hampshire:</b>		
Spring Creek.....		4,000	Bartlett, Saco River.....	5,000	
Summerland Creek.....		5,000	Berlin, Clement Brook.....	6,000	
Lodge Grass, Rotten Grass Creek.....		400	Jericho Brook.....	10,000	
Lombard, Sixteen Mile Creek.....		1,250	State Line Brook.....	6,000	
Manhattan, McLellan Creek.....		6,000	Success Pond.....		300
Ridgley Creek.....		6,000	Bethlehem Junction, Gale River and tributaries.....	10,000	
Martinsdale, Spring Creek.....		8,000	Bowman, Moose River.....	10,000	
Melrose, Canyon Creek.....		450	Bretton Woods, Abenaki Brook.....	5,000	
Miner, Miner Creek.....		1,250	Ammonoosuc River.....	25,000	
Rock Creek, Lower.....		1,000	Asquam Brook.....	4,000	
Missoula, Blackfoot River.....		2,000	Black Brook.....	5,000	
Monida, Horse Plains Creek.....		450	Clay Brook.....	5,000	
Trail Creek.....		450	Clinton Brook.....	5,000	
Norris, Power Lake.....		3,500	Crawford Brook.....	5,000	
Pony, North Willow Creek.....		3,400	Deception Brook.....	5,000	
Red Lodge, Dupont Lake.....		800	Jefferson Brook.....	5,000	
Lake DeVenny.....		800	Lake Anderson.....	15,000	
Lake Martin.....		800	Lake Carolyn.....	15,000	
Rock Creek.....		1,000	Sebossis Brook.....	5,000	
Sunnybrook Lake.....		600	Twin Rivers.....	20,000	
Red Rock, Red Rock Creek.....		450	Bristol, Clark Brook.....	2,000	
Rimini, "D" Lake.....		250	Danforth Brook.....	2,000	
Rimling, Parke's pond.....		1,000	Dick Brown Brook.....	2,000	
Sixteen Mile Creek.....		1,800	Fowler River.....	2,000	
Roberts, Clear Creek.....		800	Goose Pond.....	2,000	
Rossfork, Canyon Creek.....		2,500	Hemlock Brook.....	2,000	
Judith River.....		1,000	Newfound Lake.....	5,000	
			Patten Brook.....	2,000	
			Ten Mile Brook.....	3,000	
			Brookline, White Brook.....	300	

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs, <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs, <sup>a</sup>	Fingerlings, yearlings, and adults.
New Hampshire—Contd.			New Hampshire—Contd.		
Canaan, Blake Brook.....	2,000	.....	Manchester, Reed Brook.....	5,000	.....
Fairweather Brook.....	2,000	.....	Smith Brook.....	2,000	.....
Haynes Brook.....	2,000	.....	South Weare Brook.....	2,000	.....
Mascoma River.....	3,000	.....	Stark Brook.....	2,000	.....
Orange Pond.....	2,000	.....	Sweet Water Brook.....	3,000	.....
Sargent Brook.....	2,000	.....	Watts Brook.....	5,000	300
Cavender, Contocook River.....	.....	300	Whiting Brook.....	3,000	200
Cherry Mountain, Israel River and tributaries.....	7,500	.....	Wiggin Brook.....	.....	200
Claremont, Copeland Brook.....	2,000	.....	Woodward Brook.....	.....	300
Little Sugar River.....	4,000	.....	Meredith, Bearcamp River.....	3,000	.....
Colebrook, State fish commission.....	*50,000	.....	Nashua, Bartemus Brook.....	2,000	.....
Dover, Jenkins Brook.....	2,000	.....	Naticook Brook.....	2,000	.....
Enfield, Bicknell Brook.....	.....	200	Riverside Farm Brook.....	.....	2,000
Bog Brook.....	.....	100	Silver Spring Brook.....	2,000	.....
Lovejoy Brook.....	.....	200	Smalls Brook.....	.....	200
Fabyans, Mount Echo Brook.....	5,000	.....	Newport, Cragin Brook.....	2,000	.....
Fitzwilliam, Boyce Brook.....	2,000	.....	Gunnison Brook.....	2,000	.....
Kemp Brook.....	2,000	.....	North Woodstock, Eastman Brook.....	8,750	.....
Lawrence Brook.....	2,000	.....	Lost River.....	12,000	.....
Priest Brook.....	2,000	.....	Middle Pemigewasset River.....	5,250	.....
Scott Brook.....	3,000	.....	Oliverian, Oliverian Brook.....	4,000	.....
Franklin, Call Brook.....	2,000	.....	Percy, Christine Lake.....	.....	500
Gulf Brook.....	2,000	.....	Peterboro, Brookside Pond.....	2,000	.....
Hill Brook.....	2,000	.....	Pike, Lake Katherine.....	4,000	400
Putney Brook.....	2,000	.....	Portsmouth, Dearborn Brook.....	.....	200
Glenciff, Oliverian Brook.....	6,000	.....	Peverley Brook Pond.....	.....	300
Gorham, Upper Wild River and tributaries.....	15,000	.....	Suncook, Bow Brook.....	3,000	.....
Grafton, Davis Brook.....	1,000	.....	Deer Brook.....	2,000	.....
Hoyt Brook.....	4,000	.....	Langmaid Brook.....	2,000	.....
Orange Brook.....	2,000	.....	Twin Mountain, Zealand River and tributaries.....	7,500	.....
South Grafton Brook.....	2,000	.....	Walpole, Brush Meadow Brook.....	.....	200
Greenfield, Holt Brook.....	2,000	.....	Chandler Brook.....	.....	300
Hoovey Brook.....	2,000	.....	Great Brook.....	.....	400
Smith Brook.....	2,000	.....	Heywood Brook.....	.....	200
Groveton, Stratford Pond.....	10,000	.....	Lower Cold River.....	.....	400
Hill, Flanders Brook.....	.....	200	Warner, French Brook.....	.....	2,000
Keene, White Brook.....	2,000	.....	Meadow Brook.....	.....	2,000
Laconia, Ellsworth Pond.....	.....	300	Silver Brook.....	.....	2,000
Russell Pond.....	.....	300	Stevens Brook.....	.....	2,000
Sunapee Lake.....	.....	600	Tony Hill Brook.....	.....	2,000
Lebanon, Bliss Brook.....	.....	100	Warren, Batchelder Brook.....	.....	200
Buffalo Bill Brook.....	.....	100	Berrys Brook.....	.....	200
Great Brook.....	3,000	200	Hurricane Brook.....	.....	300
Hibbard Brook.....	2,000	200	Patch Brook.....	.....	200
Marshall Hill Brook.....	.....	200	West Canaan, Morse Brook.....	.....	200
Mink Brook.....	.....	200	Westport Independent Pond.....	1,000	.....
Smith Pond.....	2,000	.....	Wilton, Hodgdon Brook.....	2,000	.....
Stony Brook.....	2,000	200	New Jersey:		
Manchester, Bog Brook.....	.....	100	Bloomfield, Third River.....	.....	1,500
Bonan Brook.....	.....	300	Englewood, Closter Brook.....	.....	900
Cheney Brook.....	.....	200	Norwood Brook.....	.....	1,200
Cold Spring Brook.....	5,000	300	Maywood, Saddle River.....	.....	1,500
Dalton Brook.....	2,000	.....	Mount Arlington, Raritan River, South Branch.....	.....	150
Darrah Brook.....	3,000	200	Oak Ridge, Shelter Rock Lake.....	.....	3,000
Gould Brook.....	2,000	.....			
Hodgdon Brook.....	2,000	300			
Joe English Brook.....	.....	300			
Leaches Brook.....	.....	100			
Mead Brook.....	2,000	.....			
Patten Brook.....	4,000	.....			
Pierce Brook.....	3,000	200			
Pulpit Brook.....	2,000	.....			

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*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
New Jersey—Continued.			New York—Continued.		
Red Bank, Boar Bura Pond.....		300	Fulton, Lewis Creek.....	6,000	
River Edge, Passaic River, tributary of.....		600	Fulton Chain, Nicks Lake.....	15,000	
Whippany, Badgley Brook.....		600	Grand Gorge, Cole Brook.....	4,000	
New Mexico:			Greenwich, Fly Brook.....	8,000	
Bernalillo, James River.....	2,500		Hartshorn Brook.....	5,000	
Las Huertos Canon.....	3,750		Halfway, Carpenter Brook.....	12,000	
Cimarron, Cimarron River.....	9,000		Harrisville, Big Hill Pond.....	5,000	
Glorietta, Pecos River.....	16,000		Hopewell Junction, Wortlekill Creek.....	5,000	
Las Vegas, Gallinas River.....	2,500		Hudson Falls, Spring Brook Pond.....	2,000	
Raton, Sugarite River.....	7,750		Kasoag, Indian Camp Brook.....	5,000	
Sante Fe, Nambe River.....	8,750		McConnell Brook.....	5,000	
Rito Pacheco.....	2,750		Kerhonkson, Metherakonk Creek.....	4,000	
Santa Fe River.....	18,750		Kingston, Rondout Creek.....	10,000	
Tesuque River, Upper	2,750		Lafargeville, Catfish Creek.....	12,000	
New York:			Lake Mahopac, Croton River.....	10,000	
Amsterdam, Union Mills Creek.....	6,000		Lake Placid, Lake Placid.....	57,000	
Apulia, Butternut Creek Arena, Forest Lake.....	18,000	500	Lanesville, Lanesville Creek.....	5,000	
Auburn, Hemlock Brook.....	5,000		Livingston Manor, Wil-lowemoc Creek.....	8,000	
Bath, Pleasant Valley Creek.....	10,000		Long Lake West, Bett-ner Pond.....	12,000	
Bayshore, Penataquit Creek.....		150	Cub Pond.....	6,000	
Benson Mines, Ellis Creek.....	5,000		Otter Pond.....	6,000	
Little River.....	10,000		Lyons, Ackerman Brook.....	4,000	
Big Moose, Twitchell Lake.....		750	Glenmart Brook.....	4,000	
Binghamton, Nantikote Creek.....	6,000		Sodus Creek.....	5,000	
Page Brook.....	6,000		Middleburg, Keyser Kill Creek.....	6,000	
Thomas Brook.....	8,000		Millbrook, Little Rest Brook.....	2,000	
Buffalo, Brookwood Pond.....		600	Mount Pleasant, Beaver-kill Creek.....	4,000	
Garden Pond.....		500	Sawkill Creek.....	8,000	
Middle Pond.....		500	New Scotland, Kirklín Creek.....		6,000
Calcium, West Creek.....	8,000		New York, Aquarium North Ilion, Steeles Creek.....	* 5,000	
Cambridge, Coulter Brook.....	5,000		North Java, Beaver Meadow Creek.....	2,000	
Crystal Lake.....	5,000		Beaver Meadow Creek, East Branch.....	2,000	
Pommanook Creek.....	4,000		Beaver Meadow Creek, South Branch.....	2,000	
Carrollton, Nine Mile Creek.....	4,000		Cavanaugh Creek.....	2,000	
Catskill, Whipoorwill Creek.....		3,000	Dewey Creek and branches.....	8,000	
Cobleskill, Charlotteville Creek.....	6,000		Java Lake.....	6,000	
East Worcester Creek.....	6,000		McGivney Creek.....	2,000	
Vinton Creek.....	6,000		McGivney Creek, South Branch.....	2,000	
Worcester Creek.....	5,000		South Berg Creek and branches.....	12,000	
Cold Brook, Bushkill Creek.....	5,000		Tonawanda Creek and branches.....	8,000	
Cortland, Fall Brook.....	10,000		North Lansing, Gulf Creek.....		1,800
Solon Creek.....	5,000		Owego, Owego Creek.....		400
Virgil Spring Creek.....	6,000		Patterson, Croton River.....	10,000	
Cuyler, Muller Brook.....	2,000		Mountain Brook.....		300
Tripoli Creek.....	3,000		Pawling, Swamp River.....	6,000	
Eden Center, Clear Water Pond.....	4,000				
Ellenville, Rondout Creek.....	9,000				
Felts Mills, Deer Lick Creek.....	4,000				
Drake Creek.....	4,000				
Felts Mills Creek.....	8,000				
Franches Creek.....	2,000				
Leroysville Creek.....	3,000				

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*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
New York—Continued.			North Carolina:		
Phoenicia, Woodland Creek.....	5,000		Doughton, Brush Creek, Laurel Fork.....		5,000
Pine Bush, Veerkeerdekill Creek.....	5,000		Elk Creek.....		2,000
Pleasant Lake, Buck Pond.....	6,000		Edgemont, Sassafras Creek.....		2,000
Dead Creek.....	3,000		Elkland, Howard Creek.....		2,000
Longfellow Lake.....	8,000		Fontana, Eagle Creek.....		5,000
Poland, Buttler Lake.....	8,000		Granite, Brown's pond.....		3,600
Port Henry, Courtney Pond.....	6,000		Horse Shoe, Mathies Creek.....		2,400
Niagara Pond.....	6,000		Lake Toxaway, Beasley Creek.....		3,600
Sand Pond.....	6,000		Flat Creek.....		4,800
Port Jervis, Black Brook.....	4,000		Lakeside Brook.....		2,400
Kenney Brook.....	6,000		Owens Mill Creek.....		3,600
Mongaup Brook.....	10,000		Parker Creek.....		3,600
Shinglekill Creek.....	8,000		Robinson Creek.....		4,800
Steinekill Creek.....	6,000		Slickum Creek.....		3,600
Poughkeepsie, Fly Sprout Creek.....	3,000		Tennessee Creek.....		4,800
Preble, Graham Brook.....	4,000		Thompson River.....		6,000
Steele Brook.....	5,000		Tuckaseegee River.....		4,800
Ramapo, Torn Brook.....		3,900	Montezuma, Wautauga River, Boons Fork.....		5,000
Rhinecliff, Ellerslie Lake.....		4,500	Mount Sterling, Big Creek.....		8,400
Richland Junction, Salmon River, North Branch.....	10,000		Murphy, Chambers Creek.....		2,000
Rome, Fish Creek.....	10,000		Montgomery Creek.....		1,500
Mohawk River.....	18,000	6,000	North Wilkesboro, Buffalo Creek, Joes Fork.....		4,000
St. Regis Falls, Dexter Brook.....	3,000		Dugger Creek.....		4,000
East Brook.....	8,000		Grady Creek.....		5,000
St. Regis River.....	10,000		Laurel Creek.....		3,000
Saratoga Springs, Long Pond.....		300	Little Dugger Creek.....		3,000
Schenectady, Hungerkill Creek.....		10,000	Mason Branch.....		4,000
Schenevus, Elk Creek.....	5,000		Steels Branch.....		4,000
Selkirk, Ouerquethan Creek.....		10,000	Old Fort, Catawba River.....		3,000
Sherburne, Four Corners Brook.....	3,000		Pilot Mountain, Flat Shoals Creek.....		5,000
Handsome Brook.....	5,000		Sapphire, Alley Creek.....		3,600
Nigger Hollow Brook.....	3,000		Waynesville, Taylor Creek.....		4,200
Number Six Brook.....	3,000		North Dakota: Bowman, Alkali Creek.....		500
Shawler Brook.....	3,000		Ohio:		
Smyrna Brook.....	4,000		Bellefontaine, Rush Creek.....	20,000	
Syracuse, Bear Trap Creek.....	5,000		Stony Creek.....	20,000	
Carpenter Brook.....	12,000	500	Mansfield, Cahalis Creek.....	6,000	
Conklin Brook.....	3,000		Urbana, Cedar Creek.....	10,000	
De Montfrede Brook.....	12,000		Oregon:		
Elmwood Brook.....	6,000		Clackamas, Clackamas River.....		1,040
Geddes Brook.....	13,000		Oregon City, Clear Creek.....		8,689
Judd Brook.....	6,000		Milk Creek.....		3,000
Lafayette Creek.....	10,000		Salmon River.....		10,000
Nine Mile Creek.....	27,000		Silverton, Silver Creek.....		5,000
Peble Hill Brook.....		600	Pennsylvania:		
Poole Brook.....	4,000		Altoona, Blair Creek.....		3,000
South Hollow Brook.....	10,000		Bobs Creek.....		3,000
Stony Brook.....	5,000		Mill Run.....		3,000
Swamp Brook.....	12,000		Placks Run.....		3,000
Washingtonville, Sunnybrook Pond.....		1,900	Austin, Bailey Run.....		2,000
Watertown, Black River and tributaries.....	36,000		Bark Shanty Run.....		1,000
Mill Creek.....	10,000		Big Moores Run.....		2,000
West Port, Bouquette River, South Branch.....	8,000		Birch Run.....		2,000
Williamstown, Prince Brook.....	10,000		Cowley Run.....		2,000
			Dry Run.....		1,000
			East Deering Run.....		1,000
			Freeman Run.....		2,000

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
Pennsylvania—Contd.			Pennsylvania—Contd.		
Austin, Hammersley Run .....		2,000	Clearfield, Camppoke Run .....		1,000
Jones Run .....		1,000	Chase Run .....		1,000
Little Moores Run .....		2,000	Crooked Sewer Run .....		1,000
Nelson Run .....		2,000	Dixon Run .....		1,000
Portage Creek .....		1,000	Downey Run .....		1,000
Prouty Run .....		1,000	Dry Hollow Run .....		1,000
South Woods Creek .....		2,000	Eberts Run .....		1,000
Beaver Springs, Swift Run .....		2,400	Fork Run .....		1,000
Bedford, Beegles Spring Run .....		600	Haines Run .....		1,000
Diberts Run .....		600	Hampton Run .....		1,000
Bellwood, Sandy Run .....		3,000	Haney Run .....		1,000
Benton, Marion Creek .....		150	Horton Hollow Run .....		1,000
Blairs Mills, Horse Valley Creek .....		1,000	Kephart Run .....		1,000
Boiling Springs, Boiling Springs Lake .....		150	Keth Dart Run .....		1,000
Broad Run .....		150	Kline Run .....		1,000
Indian Peg Run .....		150	Lambs Run .....		1,000
Lutz Run .....		150	Little Run .....		1,000
Boswell, Card Machine Run .....		3,000	Little Lick Run .....		1,000
Pickings Run .....		3,000	Low Run .....		1,000
Quemahoning Creek, North Fork .....		3,000	McDonald Run .....		1,000
Bradford, Chapple Fork Creek .....		1,500	Maines Run .....		1,000
Sugar Run .....		1,500	Mease Run .....		1,000
Tuna Creek, East Branch .....		1,500	Merrits Run .....		1,000
Tuna Creek, West Branch .....		1,000	Ogden Run .....		1,000
Willow Creek .....		1,500	Pine Hollow Run .....		1,000
Cassandra, Bens Creek .....		1,600	Pine Swamp Run .....		1,000
Bobbs Creek .....		1,600	Reed Run .....		1,000
Cedar Hollow, Trout Creek .....		1,000	Sand Run .....		1,000
Valley Creek, North Branch .....		2,000	Schop Run .....		1,000
Valley Creek, South Branch .....		1,000	Shaws Run .....		1,000
Chambersburg, Birch Run .....		4,200	Stone Hammer Run .....		1,000
Carbaugh Run .....		2,100	Stoneville Run .....		2,000
Conococheague Creek, Upper .....		7,000	Stony Battery Run .....		1,000
Falling Springs Creek .....		2,800	Stott Run .....		2,000
Falling Springs Creek, East Branch .....		2,800	Tarkill Run .....		1,000
Falling Springs Creek, West Branch .....		3,500	Thompson Run .....		2,000
Hoosic Run .....		2,800	Wiser Run .....		1,000
Trout Run .....		300	Witch Hazel Run .....		2,000
Cherry Run, Penns Creek .....		300	Yearia Creek .....		2,000
Cherry Tree, Boiling Spring Run .....		3,000	Coatsville, Birch Run .....		1,000
Brush Run .....		1,500	Cresco, Broadheads Creek .....		1,800
Hazlett Run .....		3,000	Bushkill Creek .....		450
Kiln Run .....		1,500	Mill Creek .....		1,200
Killens Run .....		1,500	Cresson, Clearfield Creek, West Branch .....		1,500
Cheyney Walhalla Run .....		1,000	Curry, Three Spring Run .....		10,500
Cisna Run, Bixler Run .....		1,000	Delta, Mount Holly Run .....		1,500
Cisna Run .....		600	Denver, Little Muddy Creek .....		300
Clearfield, Albert Run .....		1,000	Dillsburg, Beaver Creek .....		1,800
Alder Run .....		1,000	Downingtown, Broad Run .....		2,900
Amms Run .....		1,000	Fox Run .....		600
Barnett Run .....		1,000	Pine Run .....		600
Baughman Run .....		1,000	Easton, Bushkill Creek .....		2,400
Bear Wallow Run .....		1,000	Ebensburg, Cole Run .....		400
Birch Run .....		1,000	Covered Bridge Run .....		600
Bish Run .....		1,000	Evans Run .....		600
Bowman Run .....		2,000	Hallsten Run .....		200
Browns Run .....		1,000	Highland Lake .....		400
			McCartney Run .....		800
			McGarr Run .....		200
			Moores Woods Run .....		600
			Morris Jones Run .....		400
			Phillips Run .....		400
			Roberts Run .....		400
			Upper Chest Creek .....		600
			Elbell, Cisna Run .....		1,600
			Elizabethville, Forks Creek .....		1,000
			Small Valley Run .....		1,000



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Pennsylvania—Contd.			Pennsylvania—Contd.		
Ephrata, Kurtz Pond.....		150	Gillintown, Seven Mile Run.....		1,000
Reindanbach Run.....		150	Sterling Run.....		1,000
Fairchance, Cave Hollow Run.....		3,000	Whites Run.....		1,000
Fairfield, Green Run.....		1,200	Glen Mills, Baldwin Run.....		1,000
Fields Station, Grays Run.....		1,000	Gouldsboro, Lehigh River.....		750
Flowing Spring, Canoe Creek.....		3,000	Harrisburg, Cedar Run.....		1,400
Friedens, Beaverdam Creek.....		3,000	Henderson, Crow Creek.....		1,000
Calander Creek.....		3,000	Gulph Creek.....		1,000
Kimberlen Run.....		3,000	Hershey, Spring Creek.....		300
Lick Run.....		3,000	Hoadleys, Middle Creek.....	8,000	
Miller Run.....		3,000	Wangum Creek.....	6,000	
Rhodes Creek.....		3,000	Hopewell, Beaver Creek.....		1,000
Shingle Run.....		3,000	Otts Run.....		1,000
Gaines Junction, Big Hollow Creek.....		1,000	Potter Creek.....		1,000
Bloody Run.....		1,000	Three Springs Run.....		1,000
Dewey Hollow Run.....		1,000	Huntingdon, Detwilers Run.....		200
Elk Run, West Branch.....		1,000	Martins Run.....		200
Lick Run.....		1,000	Jamison City, Briens Run.....		150
Long Run.....		1,000	Little Run.....		150
Phoenix Brook.....		1,000	Meeker Run.....		150
Remington Run.....		1,000	Pigeon Run.....		150
Spring Run.....		1,000	Spring Run.....		150
Water Trough Hollow Run.....		1,000	Sullivans Branch.....		150
Wetmore Run.....		1,000	Trout Run.....		150
Galeton, Beach Flat Brook.....		1,000	Jersey Shore, Aughenbaughs Creek.....		1,000
Buckceller Run.....		1,000	Big Run.....		1,000
Cabin Run.....		1,000	Cammal Run.....		1,000
California Run.....		1,000	Larrys Creek and Branches.....		2,000
Cushion Creek.....		1,500	Lower Pine Bottom Creek.....		1,000
Dry Hollow Creek.....		1,000	McElhattan Creek.....		2,000
Gale Run.....		1,000	McMurrin Run.....		1,000
Germania Branch.....		1,500	Otter Run.....		1,000
Hopperhouse Run.....		1,000	Ranches Run.....		1,000
Johnson Run.....		1,000	Staver Run.....		1,000
Judson Run.....		1,000	Upper Pine Bottom Creek.....		1,000
Kettle Creek.....		2,000	White Deer Creek.....		2,000
Kinsmith Creek.....		1,500	Johnstown, Baker Run.....		600
Little Kittle Creek.....		1,500	Beaver Run.....		600
Lozey Run.....		1,000	Beaverdam Run.....		600
Lyman Run.....		1,000	Bens Creek.....		600
Nine Mile Run.....		1,500	Bens Creek, Millers Branch.....		600
Painter Run.....		1,000	Bens Creek, North Fork.....		600
Pine Creek.....		2,000	Bens Creek, South Fork.....		600
Sinking Branch.....		1,500	Big Spring Run.....		600
Slyder Run.....		1,000	Blue Hole Run.....		600
Stoney Run.....		1,000	Bobs Creek.....		600
Witmore Run.....		1,000	Bottle Run.....		600
Work Path Creek.....		1,000	Breast Works Run.....		600
Gallitzin, Big Laurel Creek.....		3,000	Cables Run.....		600
Garden, Trout Creek.....		1,000	Calender Run.....		600
Valley Creek, North Branch.....		2,000	Canfields Run.....		600
Valley Creek, South Branch.....		1,000	Car Machine Run.....		600
Gillintown, Books Run.....		1,000	Clear Run.....		600
Cooks Run.....		1,000	Clear Shade Creek.....		600
Gorton Run.....		1,000	Conemaugh River, South Fork.....		600
Halls Run.....		400	Cub Run.....		600
Laurel Run.....		1,000	Daily Draft Run.....		600
McKinney Run.....		1,000	Dalton Run.....		600
Pine Run (A).....		1,000	Glade Run.....		600
Pine Run (B).....		1,000	Gray Run.....		600
Red Lick Run.....		1,000	Hinkston Run.....		600
Rock Run.....		1,000	Ingrunt Run.....		600
Rock Run, Left Fork.....		400			
Rock Run, Right Fork.....		400			

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
Pennsylvania—Contd.			Pennsylvania—Contd.		
Johnstown, Johns Mill Run.....		600	Lemont, Cedar Creek.....		1,000
Jones Mill Run.....		600	Colyers Gap Run.....		1,000
Kaufmans Run.....		600	Hassons Gap Run.....		1,600
Laurel Run.....		600	Laurel Run.....		1,000
Lick Run.....		600	McBrides Gap Run.....		1,600
Little Mill Creek.....		600	Markles Gap Run.....		1,750
Little Shade Run.....		600	Roaring Run.....		1,000
Little Solomons Branch.....		600	Shingletown Run.....		1,000
Mill Creek.....		600	Sinking Creek.....		1,000
Millers Run.....		600	Slab Cabin Run.....		1,000
Millstone Run.....		600	Spring Run (A).....		1,000
Mishler Run.....		600	Spring Run (B).....		1,000
Negro Glade Run.....		600	Stone Creek.....		1,000
Picking Run.....		600	Lewistown Junction, Havice Valley Creek.....		2,000
Pine Run.....		600	Honey Creek.....		1,800
Plitcher Run.....		600	Jacks Creek.....		2,400
Powder Mill Run.....		600	Laurel Run.....		2,000
Quemahoning Creek, North Fork.....		600	New Lancaster Valley Creek.....		1,800
Rachel Run.....		600	Treaster Valley Creek.....		1,200
Red Run.....		600	Lingonier, Furnace Run.....		4,500
Roaring Run.....		600	Grove Run.....		3,000
Runnels Mill Run.....		600	Laughlinstown Run.....		3,000
Salt Lick Run.....		600	Maginness Run.....		3,000
Sandy Run.....		600	Mill Creek.....		4,500
Shaffer Run.....		600	Penrod Run.....		3,000
Shannon Run.....		600	Rock Run.....		3,000
Shingle Run.....		600	Lilly, Bare Rock Creek.....		1,500
Solomons Run.....		600	Blairs Creek.....		3,000
Stuart Run.....		600	McElhattan, Chathams Run.....		1,000
Sugar Run.....		600	Hennessy Run.....		500
Three Springs Run.....		600	Little Chatham Run.....		500
Town Line Run.....		600	Marietta, Evans Run.....		500
Upper Dark Shade Creek.....		600	Woods Run.....		1,000
Wild Cat Run.....		600	Marsh Hill Junction, Pine Swamp Run.....		1,000
Julian, DeWitts Run.....		1,000	Shraders Creek.....		1,000
Dicks Run.....		1,000	Mawr Glen, Rock Run.....		1,000
Red Run.....		1,000	Meadville, Bramley Run.....		800
Smays Run.....		1,000	Gravel Run.....		800
Whetstone Run.....		1,000	Mercersburg, Blue Spring Run.....		1,000
King of Prussia, Crow Creek.....		1,000	Church Hill Run.....		1,000
Gulph Creek.....		1,000	Diceys Run.....		1,000
Trout Creek.....		1,000	Meyersdale, Eichorn Run.....		3,000
Kinzers, Meadowbrook Run.....		1,000	Meadow Run.....		4,500
Lakewood, LaBar Brook Run.....		1,800	Seckler Run.....		3,000
Lamar, Bear Run.....		200	Middleport, Big Creek.....		1,800
Cherry Run.....		300	Mifflin, Macedonia Creek.....		1,200
Fishing Creek.....		400	Suloff Creek.....		1,200
Kettle Creek.....		300	Millers, Pine Run.....		600
Laurel Run.....		200	Mill Lane, Crow Creek.....		1,000
Spring Run.....		200	Mont Alto, Birch Run.....		1,800
Lancaster, Conogingo Creek, Branch of.....		1,000	Carbaugh Run.....		1,500
Groffs Dale Run.....		1,000	Forge Creek.....		1,800
Lefever Run.....		600	Little Antietam Creek.....		1,800
Martins Run.....		1,000	Raccoon Run.....		1,200
Middle Run.....		1,000	Moscow, Bell Meadow Brook.....		300
Larrys Creek, Larrys Creek, Second Fork.....		2,000	Spring Brook.....		1,800
Leaman Place, Keneagy Run.....		1,000	Van Brunts Creek.....		1,200
Lebanon, Hammer Creek.....		1,000	Mount Hope, Little Chickies Creek.....		1,000
Indiantown Creek.....		1,000	Mount Union, Drakes Thicket Run.....		2,000
Poplar Run.....		500	McClains Gap Run.....		2,000
Leighton, Hahn Creek.....		600	Old Womans Run.....		3,000
Lemont, Big Spring Run.....		1,600	Roberts Run.....		3,000
Buffalo Run.....		1,000			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
Pennsylvania—Contd.			Pennsylvania—Contd.		
Mount Union, Scrub Gap Run.....		3,000	Philipsburg, Winburn Run.....		650
Singers Gap Run.....		3,000	Wolf Run.....		650
Munster, Connory Run.....		3,000	Picture Rocks, Frys Run.....		1,000
Little Hemlock Creek.....		1,500	Laurel Run.....		1,000
Narvon, Hammer Town Run.....		1,000	Muncy Creek.....		1,500
New Centerville, Trout Creek.....		1,000	Roaring Run.....		1,000
Valley Creek, North Branch.....		1,000	Pine Grove Furnace, Mountain Creek.....		1,500
New Ringgold, Hiehl Run.....		600	Plane Brook, Trout Creek.....		1,000
Nisbet, Benders Run.....		1,000	Pocono Lake, Toby-hanna Creek.....		4,200
Big Run.....		1,000	Portage, Bobs Creek.....		3,000
Oil City, Horse Creek.....		800	Laurel Creek.....		1,600
Pithole Creek.....		1,200	McDunns Creek.....		1,600
Orrtanna, Back Run.....		150	Port Allegany, Coleman Run.....		1,000
Big Marsh Creek.....		150	Comes Creek.....		1,000
Little Marsh Creek.....		150	Skinner Creek, Coal-bed Branch.....		1,000
Osceola Mills, Bear Run.....		2,000	Skinner Creek, Left Hand Branch.....		1,000
Mountain Branch.....		3,000	Port Matilda, Bear Run.....		1,000
Trout Run.....		3,000	Bushy Run.....		1,000
Paddy Mountain, Panther Run.....		2,000	California Run.....		1,000
Poe Run.....		2,000	Coal Run.....		1,000
Swift Run.....		2,000	Five Mile Run.....		1,000
Paoli Road, Valley Creek, North Branch.....		1,000	Flat Rock Run.....		1,000
Valley Creek, South Branch.....		1,000	Laurel Run.....		1,000
Patton, Bender Run.....		1,500	Pine Run.....		1,000
Chest Creek.....		3,000	Shirer Run.....		1,000
Dutch Run.....		1,500	Spring Run.....		1,000
Killbuck Creek.....		3,000	Spruce Run.....		1,000
Mud Lick Creek.....		3,000	Stony Creek.....		1,000
Risban Run.....		1,500	Tumbling Run.....		1,000
Rock Run.....		1,500	Woodring Hollow Run.....		1,000
Rogue Harbor Run.....		1,500	Pottsville, Potts Creek.....		300
Slate Lick Creek.....		3,000	Shoeners Run.....		150
Wire Rock Run.....		3,000	Ralston, Acid Branch.....		500
Philipsburg, Alder Run.....		650	Hound Run.....		500
Barkers Run.....		650	Miners Sleepy Run.....		500
Bark Shed Run.....		650	Moyers Run.....		500
Beaver Run.....		700	Yellow Run.....		500
Belgers Run.....		650	Yellow Dog Run.....		500
Butler Run.....		650	Reading, Brindley Run.....		3,000
Coal Spring Run.....		650	Brunnerkill Creek.....		1,000
Corbin Run.....		650	Cold Run.....		3,600
Curry Run.....		650	Hopewell Creek.....		1,000
Dayton Run.....		650	Little Linden Creek.....		500
Deep Rock Run.....		650	Moselm Creek.....		300
Echo Run.....		700	North Heidelberg Creek.....		1,000
Four Mile Run.....		650	Peters Creek.....		500
Hess Run.....		700	Plum Creek.....		300
Hutton Run.....		650	Six Penny Creek.....		1,000
Laurel Run.....		650	Willow Creek.....		300
Loop Run.....		650	Reedsville, Hanie Valley Run.....		1,600
McCords Run.....		650	Honey Creek.....		300
Nasons Run.....		650	Kishacoquillas Creek.....		300
North Run.....		650	Lingle Run.....		300
One Mile Run.....		650	Stone Creek.....		3,000
Potter Run.....		650	Tea Creek.....		600
Sensors Run.....		650	Treaster Valley Run.....		1,600
Seven Springs Run.....		650	Ridgway, Bear Creek.....		2,000
Shields Run.....		650	Belmuth Run.....		1,000
Splash Run.....		650	Big Mill Creek.....		2,000
Tomahawk Run.....		650	Ellithorpe Run.....		1,000
Trout Run.....		650	Highland Pond.....		2,000
Twigs Run.....		650	Island Run.....		1,000
Turtle Spring Run.....		650	Laurel Run.....		1,000
Vails Run.....		650			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Pennsylvania—Contd.			Pennsylvania—Contd.		
Ridgway, Mohan Run.....		1,000	Tobyhanna, Tobyhanna Creek.....		2,400
Standing Stone Run.....		500	Unionville, Halls Run.....		1,000
Roaring Springs, Cowens Creek.....		1,300	Rock Run.....		1,000
Lowers Creek.....		1,400	Wallace Run.....		2,000
Maple Run.....		1,300	Waterville, Bark Cabin Run.....		600
Meadow Branch.....		1,300	Buckeye Run.....		600
Potter Creek.....		1,300	Dam Run.....		1,000
Roaring Spring Creek.....		1,300	English Run.....		1,600
Snyder Creek.....		1,300	Hackett Fork Creek.....		600
Three Spring Run.....		1,300	Love Run.....		600
Rohrerstown, Shenks Run.....		1,000	Otter Run.....		1,000
Rossiter, Sisseney Run.....		2,400	School House Run.....		1,000
Royersford, Birch Run.....		2,000	Watsonstown, Lick Run.....		1,600
Pierson Run.....		1,000	Sand Spring Run.....		1,600
Rock Run.....		1,000	White Deer Creek and tributaries.....		2,100
Savan, Campbell Run.....		800	Waymart, Lackawaxen Creek.....		3,000
Scranton, Stafford Meadow Brook.....		1,800	Waynesboro, Antietam Creek, East Branch.....		450
Shrewsbury, Codorus Creek, Branch of.....		1,500	Baileys Lake.....		150
Deer Creek.....		1,500	Gap Run.....		1,000
Slate Run, Baldwin Run.....		1,200	Hoovers Run.....		1,000
County Line Creek.....		1,200	Shockey's pond.....		150
Francis Branch.....		1,200	Swift Run.....		1,500
Lebo Creek.....		1,200	Vineyard Run.....		1,000
Little Slate Run.....		5,200	Westcolang, Westcolang Creek.....	4,000	
Slate Run.....		1,200	West Hickory, Beaver Creek.....		250
Slate Run, Manor Fork.....		600	Camp Run.....		250
Somerset, Ankney Run.....		3,000	Coalbed Branch.....		250
Blue Hole Run.....		3,000	Coon Creek.....		250
Brugh Run.....		3,000	Hall Mill Branch.....		250
Clear Run.....		3,000	Jacks Run.....		250
Fishing Run.....		3,000	Jaybuck Run.....		250
Jones Mill Run.....		3,000	Klondyke Run.....		250
Kooser Run.....		1,500	Lick Run.....		250
Lohr Run.....		3,000	Little Otter Run.....		250
Miller Run.....		3,000	Middle Creek.....		250
Quemahoning Creek, North Fork.....		3,000	Minister Creek.....		250
Shaffer Run.....		3,000	Otter Creek.....		250
Trout Run.....		1,500	Prather Run.....		250
Stewartstown, Andersons Run.....		600	Queen Creek.....		250
Daniel Leibs Run.....		900	Rocky Branch.....		250
Gemmills Run.....		600	Rynd Mill Branch.....		250
Liggit Run.....		900	West Nanticoke, Blyth Bum Creek.....		600
Tamaqua, Kramers Run.....		150	Little Wapwallopen Creek.....		1,200
Tionesta, Bates Run.....		250	Peggy Hunter Creek.....		600
Bear Creek.....		250	Phillips Creek.....		600
Big Coon Creek.....		250	Shingle Run.....		1,200
Council Run.....		250	Spayds Creek.....		600
Dawson Run.....		250	Wharton, Birch Run.....		1,000
Fork Run.....		250	Wilcox, Eunice Pond.....		750
Jakes Run.....		250	Maxine Pond.....		750
Jamison Run.....		250	Oil Creek.....		750
Johns Run.....		250	Ray Pond.....		750
Jug Handle Run.....		250	Williamsport, Calehoff Creek.....		2,100
Korb Run.....		250	Laurel Run.....		1,400
Lamentation Run.....		250	Plunkett Creek.....		1,400
Little Coon Creek.....		250	Shingle Run.....		700
Little Tionesta Creek.....		250	Snake Creek.....		1,400
Lower Piney Run.....		250	Sugar Camp Creek.....		1,400
Peters Run.....		250	Windber, Beaver Dam Run, Upper.....		1,800
Pigeon Run.....		250	Berkebile Run.....		1,800
Prather Run.....		250	Big Paint Creek.....		1,800
Recks Run.....		250	Biscuit Spring Run.....		1,800
Ross Run.....		300	Breastworks Creek.....		1,800
Sibble Run.....		250	Clear Shade Creek.....		1,800
Tubbs Run.....		500	Cub Run.....		2,600
Upper Piney Run.....		250			
Vockroth Run.....		250			
West Hickory Creek.....		250			

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*): all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Pennsylvania—Contd.			South Dakota—Contd.		
Windber, Dark Shade Run.....		900	Nemo, South Box Elder Creek.....		800
Glass Run.....		1,800	Oreville, Bear Gulch Creek.....		6,000
Layton Run.....		800	Spring Creek.....		20,000
Mangus Run.....		800	White Horse Gulch Creek.....		6,000
Moore's Run.....		800	Pringle, Carroll Creek.....		10,000
Piney Run.....		3,400	Rapid City, Indian School Lake.....		10,000
Roaring Fork Run.....		1,600	Schamber Creek.....		5,000
Seeser Run.....		800	Sickler Pond.....		5,000
South Fork Creek.....		1,800	Rochford, Peterson Pond.....		5,000
Turkey Run.....		800	Rapid Creek.....		800
Wentz Run.....		800	Rapid Creek, North Fork.....		800
Whitaker Run.....		800	Riley Pond.....		4,000
Youngdale, Johnson Run.....		1,000	Spearfish, Driskill Ponds.....		2,000
McElhattan Run.....		1,000	Falsebottom Creek.....		15,000
Simox Run.....		1,000	Spring Creek.....		200
York, Deer Creek.....		1,200	Victoria, Spearfish Creek.....		25,000
Kundard Valley Creek.....		1,200	Webster, Big Spring Creek.....		200
Trout Run.....		1,200	Chickapaw Creek.....		200
Rhode Island:			Tennessee:		
Centerville, Kickemuit Run.....		200	Elkmont, Jakes Creek.....		4,000
Woonsocket, Reservoir Run.....		100	Erwin, Foster Mill Creek.....		5,250
South Carolina: Pickens, Big Laurel Creek.....			Morristown, Taylor Creek.....		7,200
South Dakota:			Rogersville, Berry's pond.....		1,000
Aladdin, Hay Creek, Middle Fork.....		20,000	Utah:		
Buffalo Gap, Beaver Creek.....		15,000	Charleston, Willow Farm Lake.....		500
Custer, French Creek.....		16,000	Ogden, Canyon Creek.....		3,500
Deadwood, West Two-bit Creek.....		200	Salt Lake City, Ogden River.....		8,050
Elmore, Spearfish Creek.....		20,375	Springville, Provo River.....		6,000
State fish commission.....		50,000	State fish commission.....	* 100,000	
Wildcat Creek.....		375	Vermont:		
Galena, Bear Butte Creek.....		25,000	Arlington, Battenkill River.....		500
Trout Creek.....		8,000	Cold Brook.....		125
Hanna, Spearfish Creek, East Fork.....		10,000	Dyer Brook.....		125
Harney Canyon, Spring Creek.....		20,000	Green River.....		250
Hill City, Bob Cat Creek.....		5,000	Hopper Brook.....		125
Chinaman Gulch Creek.....		6,000	Lye Brook.....		250
Harney Peak Creek.....		5,000	Mill Brook.....		125
Marshall Creek.....		6,000	Reid Brook.....		125
Palmer Gulch Creek.....		8,000	South Fork Brook.....		125
Palmer Gulch Creek, Nelson Fork.....		5,000	Ted Hollow Brook.....		125
Paterson Creek.....		5,000	Warm Brook.....		250
Reno Gulch Creek.....		8,000	Barnet, Aiken Brook.....	3,000	
Spring Creek and tributaries.....		40,000	East Peacham Brook.....	5,000	
Keystone, Battle Creek.....		250	Harvey Brook.....	3,000	
McLaughlin, Oak Creek.....		20,000	Roy Brook.....	3,000	
Martin, Stanley Creek.....		6,000	Sucker Brook.....	4,000	
Maurice, Spearfish Creek.....		1,500	Barre, Brookfield Branch.....	8,000	
Squaw Creek.....		8,000	Emerson Brook.....	4,000	
Mystic, Antler Lake.....		8,000	Esthemus Brook.....	8,000	
Castle Creek.....		800	Jail Brook.....	3,000	
Deer Creek.....		10,000	Labrador Brook.....	6,000	
Lime Kiln Creek.....		15,000	Spicer Brook.....	4,000	
Little Rapid Creek.....		15,000	Bennington, Basin Brook.....		125
Nugget Creek.....		10,000	Bickford Hollow Brook.....		250
Slate Creek.....		15,000	Big Hell Hollow Brook.....		250
Nemo, Bear Butte Creek.....		2,000	Big Pond.....		150
Box Elder Creek.....		2,400	Bourne Brook.....		250
Jim Creek.....		400			
Smith Creek.....		400			

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
<b>Vermont—Continued.</b>			<b>Vermont—Continued.</b>		
Bennington, Bowles Brook.....		125	Greensboro, Caspian Lake.....	3,000	
Dewey Brook.....		125	Lamoille River.....	20,000	
Dunville Brook.....		250	Long Pond.....	3,000	
Furnace Brook.....		125	Stannard Brook.....	3,000	
Marshall Brook.....		125	Taylor Brook.....	3,000	
Mill Brook.....		125	Greensboro Bend, East Greensboro Brook.....	3,000	
Perry Thompson Brook.....		125	Groton, Darling Pond.....	63,000	3,000
Rake Branch.....		125	Hardwick, Abutment Brook.....		2,000
Redfield Brook.....		125	Alder Brook.....	3,000	
Reservoir Brook.....		125	Ayer Brook.....	2,000	
Roaring Branch.....		125	Bailey Brook.....		4,000
Rockwood Branch.....		125	Bell Brook.....	2,000	
South Brook.....		125	Buffalo Road Brook.....	2,000	
Still Brook.....		125	Bunker Brook.....	2,000	
Walloomsac River.....		125	Cate Brook.....	2,000	
Waters Brook.....		125	Collier Brook.....	2,000	
Woodford City Brook.....		125	Cooper Brook.....	2,000	
Yaw Pond Brook.....		125	Currier Brook.....		2,000
Brattleboro, Mill Brook.....		200	Eaton Brook.....	2,000	
Bristol, Baldwin Brook.....	5,000		Foss Brook.....	2,000	
Durfee Brook.....			High Trestle Brook.....	2,000	
Dyke Brook.....	3,000		Laundry Brook.....	2,000	
Hewitt Brook.....	2,000		Marshall Brook.....	2,000	
Norton Brook.....	2,000		Nichols Pond Brook.....	2,000	
Paine Brook.....	2,000		Norris Brook.....	2,000	
Concord, Pond Brook.....	5,000		Paine Brook.....	4,000	
Cuttingsville, Brown Brook.....	2,000		Porter Brook.....	3,000	
Depot Brook.....	3,000		Smith Brook.....	2,000	
Plumley Brook.....	5,000		Tucker Brook.....	3,000	
Smith Brook.....	3,000		Warren Brook.....	2,000	
Danville, Brown Brook.....	3,000		Holden, Barnard Brook.....	10,000	
Crane Brook.....	2,000		Bassett's Brook.....	2,000	
Haviland Brook.....	2,000		Clarke Brook.....	3,000	
Heath Brook.....	2,000		Clover Vale Brook.....	5,000	
Langmaid Brook.....	2,000		Coburn Brook.....	6,000	
Mineral Spring Brook.....	2,000		Doolan Brook.....	2,000	
Palmer Brook.....	2,000		Durklee Brook.....	5,000	
Poole Brook.....	2,000		Elliott Brook.....	6,000	
Spaulding Brook.....	5,000		Furnace Brook.....	32,000	
Stone Brook.....	2,000		Furnace Brook, South Branch.....	6,000	
Sucker Brook.....	2,000		Furnace Brook, West Branch.....	6,000	
Thompson Brook.....	2,000		Leonard Brook.....	5,000	
Tice Brook.....	2,000		North Branch.....	6,000	
Wells Brook.....	2,000		Phalen Brook.....	2,000	
Whyman Brook.....	5,000		Randall Brook.....	6,000	
Williams Brook.....	2,000		Sand Spring Brook.....	3,000	
Derby Line, Tomofobia River.....		400	Spofford Brook.....	3,000	
East Berkshire Nelson Pond.....	2,000		Valley View Brook.....	5,000	
East Dorset, Battenkill River.....		250	Hyde Park, Boardman Brook.....	10,000	
East Putney, Slab Hollow Brook.....		10,000	Hyde Pond.....	4,000	
Edgewater, Bill Young Brook.....		3,000	In wood, Newman Brook.....	3,000	
Gosland Brook.....		2,000	Randall Brook.....	3,000	
Kelley Brook.....		2,000	Sutton Brook.....	3,000	
Niggerhead Ledge Brook.....		2,000	Warden Brook.....	3,000	
Nigger Head Pond Brook.....		3,000	Island Pond, Carroll Brook.....	4,000	
Niggerhead Pond.....		300	Castonguay Brook.....	4,000	
Ely, Ompompanoosac Creek.....		2,000	Cold Spring Brook.....	3,000	
Enosburg Falls, Cold Hollow Brook.....	5,000		Dallol Brook.....	6,000	
Ladd Trout Brook.....	3,000		Fraser Brook.....	4,000	
Mineral Spring Brook.....	3,000		Langer Brook.....	6,000	
Pat Brady Brook.....	3,000		Mill Brook.....	5,000	
Tyler Creek, Bakersfield Branch.....	6,000		Nulhegan River.....	15,000	
			Ossogochi Creek.....	5,000	
			Pherrins River.....	8,000	
			Pine Brook.....	4,000	
			Rosebrooks Brook.....	3,000	
			Stott Brook.....	5,000	

\* Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
<b>Vermont—Continued.</b>			<b>Vermont—Continued.</b>		
Lanesboro, Osmoore Pond.....	10,000		Orleans, Dewey Brook.....	3,000	
Peacham Pond.....	10,000		Dunham Brook.....	4,000	
Ludlow, Branch Brook.....	2,000		Dutton Brook.....	3,000	
Mayo Brook.....	4,000		Gallup Brook.....	5,000	
Lyndon, Hawkins Brook.....	5,000		Long Pond.....	12,000	
Line Brook.....	2,000		Willoughby River.....	10,000	
Notch Brook.....	2,000		Plainfield, Kingsbury Brook.....	3,000	3,000
Sheldon Brook.....	2,000		Pigeon Pond.....	10,000	
Sky Farm Brook.....	2,000		Randolph, Adams Brook.....	3,000	
Lyndonville, Dish Mill Brook.....	4,000		Annis Brook.....	3,000	
Flowers Brook.....	3,000		Ayers Brook.....		300
Keach Brook.....	2,000		Bass Brook.....	2,000	
Willow Pond.....		600	Bear Hill Brook.....		3,000
Manchester, Battenkill River.....		250	Beedle's pond.....		2,000
Battenkill River, West Branch.....		8,000	Blanchard Brook.....	2,000	
Bourne Brook.....		250	Bowman Brook.....	3,000	
Cold Spring Brook.....	2,000		Chandler Brook.....	3,000	
Dorset Brook.....		6,000	Clough Brook.....	3,000	
Gray Brook.....	3,000		Fishers Brook.....	2,000	
Jinks Brook.....	6,000		Guild Brook.....	2,000	
Lucas Brook.....	3,000		Gulf Brook.....	3,000	
Matture River.....	15,000		Howard Hill Brook.....	3,000	
Norman Brook.....	2,000		Lake Mafeba.....		150
Prentiss Brook.....	4,000		Lower Ayers Brook.....	5,000	
Rogers Brook.....	4,000		Mann Brook.....		2,000
West Branch Brook.....		250	Meadow Brook.....	3,000	
Marshfield, Beaver Pond.....	10,000		Morse Brook.....	2,000	
Doctortown Brook.....	6,000		Mud Pond.....	10,000	
Mark Mears Brook.....	4,000		Ocha Brook.....	3,000	
Niggerhead Brook.....	6,000		Poverty Lane Brook.....		3,000
Niggerhead Pond.....	3,000		Riford Brook.....	4,000	
Middlesex, Long Brook.....		5,000	Roods Brook.....		2,000
Riley & Benton Brook.....		2,000	Roxbury Brook.....	3,000	
Morrisville, Bedell Brook.....	3,000		Soper Brook.....		2,000
Boardman Brook.....	3,000		Spears Brook.....	3,000	
Bugbee Brook.....	2,000		Upper Ayers Brook.....		2,000
Campbell Brook.....	5,000		Readsboro, Deerfield River, West Branch.....	10,000	
Clement Smith Brook.....	3,000		Estey Brook.....	4,000	
Coppermine Brook.....	4,000		Howe Brook.....	3,000	
Darling Brook.....	3,000		Lamb Brook.....	3,000	
Elmore Brook.....	3,000		Mullett Brook.....	4,000	
Fletcher Brook.....	6,000		Searsbury Brook.....	3,000	
Green River Brook.....	10,000		South Branch.....	9,850	
Hatch Brook.....	2,000		Yaw Pond Brook.....	4,000	
Hazen Brook.....	3,000		Richmond, Fay Conner Brook.....		2,000
McFall Brook.....	8,000		Rutland, Billings Brook.....		200
Potash Brook.....	2,000		Blanchard Brook.....		100
Rider Brook.....	4,000		Brown Brook.....	2,000	
Shippy Brook.....	2,000		Cold River.....	4,000	
Small Brook.....	4,000		East Creek.....		300
Upper Terrell Brook.....	12,000		Eddy Brook.....	3,000	
Newport, Miller Brook.....	3,000		Fenton Brook.....	5,000	
North Duxbury, Ridley Brook.....		4,000	Hewett Brook.....		200
North Ferrisburg, Meader Brook.....	2,000		Killington Brook.....	4,000	
Norton Mills, Forest Brook.....	4,000		Kiln Brook.....	5,000	
Forest View Brook.....	2,000		Little Brook.....		100
Lewis Lake.....	15,000		Lord & Lincoln Brook.....	5,000	
Little Averill Brook.....	2,000		McDevitts Brook.....	2,000	
Little Averill Lake.....	15,000	450	Osgood Brook.....		200
Morrill Brook.....	5,000		Parker Brook.....	2,000	
Norton Lake.....	20,000		Picnic Brook.....		100
Nulhegan Brook.....	15,000		Pike Brook.....	3,000	
Norwich, Lake Mitchell.....		2,600	Schoolhouse Brook.....	2,000	
			Shelden Brook.....	5,000	
			Wheeler Brook.....	3,000	
			St. Johnsbury, Adams Brook.....	2,000	
			Albesir Brook.....	2,000	
			Bacon Brook.....	2,000	
			Bennett Brook.....	2,000	

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Vermont—Continued.			Vermont—Continued.		
St. Johnsbury, Blodgett Brook (A).....	2,000		Taftsville, Babcock Brook.....	6,000	
Blodgett Brook (B).....	2,000		Beaver Brook.....	6,000	
Bonett Brook.....	2,000		Walden, Roger's pond.....	8,000	
Bundy Brook.....	2,000		Wardsboro, Little Whetstone Brook.....		500
Carpenter East Brook.....	2,000		Wait Brook.....		500
Carpenter West Brook.....	2,000		Waterbury, Blushhill Brook.....		2,000
Cary Brook.....	2,000		Gosnett Hill Brook.....		2,500
Chesterfield Brook.....	3,000		Guild Brook.....		2,500
Clifford Brook.....	4,000		Henry Hill Brook.....		2,000
Cold Brook.....	2,000		Ricker Mountain Brook.....		2,500
Curtis Brook.....		200	Wells River, Club Ponds.....	20,000	
East Branch Brook.....	2,000		West Burke, Burnham Brook.....	2,000	
Fairbanks Brook.....	2,000		Clark Brook.....	6,000	
Gage Brook.....	2,000		Eaden Brook.....	6,000	
Hemingway Brook.....	2,000		Mud Pond.....	6,000	
Harris Brook.....	2,000		Reed Brook.....	2,000	
Hastings Brook.....	3,000		Twombly Brook.....	2,000	
Hawkins Brook.....	5,000		West Hartford, Little Brook.....		300
Houghton Brook.....	4,000		Rockland Brook.....	2,000	
Joyce Brook.....	2,000		Sherburne Warren Brook.....	2,000	
Lawrence Brook.....	2,000		West Paulett, Indian River.....	20,000	
Lime Brook.....	2,000		Wilmington, Beaver Brook.....	5,000	
Lurchin Brook.....	2,000		Cold Brook.....	5,000	
Lyster Brook.....	2,000		Graves Brook.....	4,000	
Meeham Brook.....	2,000		Windsor, Mill Brook.....		15,000
Miles Brook.....	2,000		Wolcott, East Elmore Branch.....	8,000	
Morrill Brook.....	4,000		Pond Brook.....		200
Niles Brook.....	2,000		Woodstock, Bridge-water Hollow Brook.....		200
North Brook.....	2,000		Burligan Brook.....		100
North Church Brook.....	2,000		Curtis Brook.....		200
Oram Stevens Brook.....	2,000		Earl Brook.....		100
Palmer Brook.....	2,000		Five Corners Brook.....	8,000	
Paquin Brook.....	2,000		Gulf Brook.....	10,000	
Pierce Brook.....	2,000		Happy Valley Brook.....	4,000	
Pope Brook.....	6,000		Marsh Brook.....		100
Pumpkin Hill Brook.....	4,000		North Branch.....	10,000	
Rickaby Brook.....	2,000		Ottawaquhee River.....	6,000	
Roberts Brook.....	2,000		White Brook.....		100
Shattuck Brook.....	2,000		Wyman's pond.....		200
Shaw Brook.....	2,000		Virginia:		
Sleepers River.....	26,000		Abingdon, Herald Creek.....		100
Spaulding Brook.....	2,000		Bedford, Stony Creek.....		3,000
Stanton Brook.....	2,000		Big Island, Hunting Creek.....		5,500
Taft Brook.....	3,000		Harrisonburg, North River, North Fork.....		5,000
Walter Andrie Brook.....	4,000		Hot Springs, Muddy Run.....		3,000
Wards Brook.....	2,000		Hunters, Snake Den Creek.....	14,000	
Watermans Brook.....	2,000		Mechum River, Moor-man River.....		1,000
Wells Brook.....	2,000		Monterey, Potomac River, South Branch.....		2,500
West Brook.....	2,000		New Market, Pitt Spring Creek.....		1,600
Willow Pond.....	10,000		Potts Valley, Big Stony Creek.....		3,000
Wright Brook.....	2,000		Rockfish, Stony Creek.....		3,500
Shaftsbury, Lake Shaftsbury.....		300	Woodstock, Little Stony Creek.....		2,400
Sharon, Lake Mitchell.....	50,000	1,000	Sand Spring Creek.....		1,600
South Royalton, Alco Pond.....	8,000				
South Ryegate, Bailey Pond.....	2,000				
Long Pond.....	34,400				
Scott Brook.....	11,000				
Springfield, Commissary Brook.....		3,000			
Garretts Brook.....		5,000			
Joe Boss Brook.....		3,000			
Scireable Brook.....		3,000			
West Springfield Brook.....		3,000			
Sutton, Bailey Brook.....	3,000				
Bundy Brook.....	2,000				
Butterfield Brook.....	3,000				
Sanborn Brook.....	3,000				
Willard Brook.....	2,000				
Swanton, Dian Brook.....		256			

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
Washington:			Wisconsin—Continued.		
Albion, Bryan's pond.....		500	Alma Center, Stockwell Creek.....		3,000
Coppock's pond.....		500	Town Creek.....		1,500
Rice's pond.....		500	Trempealeau River.....		4,500
Everett, Lake Stevens State fish commission.....	*50,000	3,000	Trempealeau River, South Branch.....		1,500
Four Lakes, Beaver Lake.....		3,000	Amberg, Little South Branch.....		1,200
Patshuk Lake.....		1,000	Antigo, Eau Claire River, East Branch.....		200
Round Lake.....		2,000	Eau Claire River, West Branch.....		200
Salmon House Lake.....		1,000	Lily River.....		100
Swan Lake.....		2,000	Arcadia, American Valley Creek.....		100
Tohomish Lake.....		3,000	Bills Valley Creek.....		700
Waucoma.....		2,000	Borst Valley Creek.....		100
Pomeroy, Tucannon River.....		2,750	Eagle Valley Creek, East Branch.....		100
Snoqualmie (applicant).....	*50,000		Eagle Valley Creek, West Branch.....		100
Tacoma, Ipsut Creek.....		6,000	French Creek.....		100
Vancouver, Cedar Creek Little Washougal River.....	*50,000	3,000	Holcomb Coolie Creek.....		100
Washougal River, North Fork.....		544	Kreher Creek.....		100
West Virginia:			Meyers Valley Creek.....		100
Albright, Elsie's Run.....		3,000	Newcomb Valley Creek.....		100
Alexander, Buckhannon River, East Fork.....		4,000	Pine Creek.....		100
Bismarck, Difficult Run.....		4,800	Wolf Creek.....		100
Stony River.....		6,000	Ashland, Cedar Creek.....		800
Cass, Cheat River, Shaffers Fork.....		162,000	Day Creek.....		800
Hancock, Springvale Run.....		200	Hassard Creek.....		800
Horton, Big Run.....		9,000	North Branch.....		800
Gandy Creek.....		6,000	Pine Creek.....		1,600
Grants Run.....		3,000	Spring Creek.....		800
Greenbrier River, Headwaters.....		6,000	Trout Creek.....		800
Seneca Creek.....		4,000	Whittlesy Creek.....		2,400
Swallow Rock Run.....		3,000	Athalaistane, Little Eagle Creek.....		900
Keyser, Block House Run.....		3,000	Athens, Rib River.....		700
Marlington, Swago Creek.....		2,000	Wood Creek.....		700
Midvale, Cassity Creek.....		600	Augusta, Beef River, North Branch.....		1,950
Rainelle, Big Clear Creek.....		4,000	Bridge Creek.....		1,950
Richwood, Cherry River.....		4,000	Diamond Valley Creek.....		1,300
Stony Bottom, Elk Lick Run.....		1,600	Hathaway Creek.....		650
Terra Alta, Snowy Creek, North Fork.....		4,500	Hay Creek.....		1,950
Snowy Creek, South Fork.....		4,500	Sand Creek.....		1,300
Spring Run.....		1,500	Whippoorwill Creek.....		650
White Sulphur Springs, Howard Creek.....		8,500	Barneveld, Clavahu Run.....		1,500
Wisconsin:			Eveland Run.....		1,500
Alma, Johns Valley Creek.....		1,050	Harris Brook.....		1,500
Little Waumandee Creek.....		1,050	Jalos Branch.....		1,500
Trout Run.....		1,000	Lanpop Run.....		1,500
Waumandee Creek.....		1,050	Loyd Creek.....		3,000
Wolf Creek.....		700	Meadow View Brook.....		1,500
Alma Center, Arno Creek.....		1,500	Moyers Run.....		1,500
Buttke Creek.....		1,500	Walnut Hollow Creek.....		1,500
Jack Creek.....		1,500	Williams Creek.....		1,500
Juddins Creek.....		1,500	Willow Creek.....		1,500
North Branch Creek.....		3,000	Beaver Dam, Shaw Creek.....		2,000
Sisney Creek.....		1,500	Bennet, Middle River.....		2,400
			Big Falls, Killin Brook.....		300
			Black River Falls, Allen Creek.....		600
			Babcock Creek.....		300
			Bacon Creek.....		300
			Clear Creek.....		600
			Douglas Creek.....		300
			French Creek.....		600
			Hoffman Creek.....		600

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
<b>Wisconsin—Continued.</b>			<b>Wisconsin—Continued.</b>		
Black River Falls, Kenyon Creek.....		600	Bloomer, O'Neil Creek.....		50
Kusek Creek.....		300	O'Neil Creek, West Fork.....		50
Larkin Creek.....	1,300		Otter Creek.....		50
Lewis Creek.....		300	Pine Creek.....		50
Morrison Creek.....		300	Popple Creek.....		50
Perry Creek.....		600	Sand Creek.....		50
Pine Creek.....		600	Stevens Creek.....		50
Ranch Creek.....		300	Ten Mile Creek.....		50
Roaring Creek.....		600	Trout Creek.....		50
Robinson Creek.....		600	Blue Mounds, Aavang Creek.....		1,500
Sand Creek.....		300	Austin Creek.....		1,500
Slosser Creek.....		600	Camp Creek.....		1,500
Snow Creek.....		600	Frames Creek.....		1,500
Spring Creek.....		300	Garfort Creek.....		1,500
Squaw Creek.....		300	Kester Creek.....		1,500
Stenalson Creek.....		600	Ryans Creek.....		1,500
Stony Creek.....		600	Walnut Hollow Creek.....		1,500
Tank Creek.....		600	Brokaw, Silver Creek.....		2,700
Trout Creek.....		300	Camp Douglas, Fountain Creek.....		1,000
Twin Creek.....		600	Carter, Oconto River, North Branch.....		200
Van Hessel Creek.....		600	Colfax, Hay Creek.....		100
Visno Creek.....		600	Otter Creek.....		100
Blair, Bear Creek.....	1,500		Coloma, Wade Creek.....		900
Beaver Creek.....	3,000		Crandon, Web Creek.....		600
Beaver Creek, North Branch.....		3,000	Deer Park, Willow River, South Fork.....		700
Beaver Creek, South Branch.....		1,500	Dodgeville, Conley Branch.....		1,500
Bergs Creek.....		1,500	Davies Creek.....		1,500
Durham Creek.....		1,500	Jones Branch.....		1,500
Edwins Creek.....		1,500	Knudson Creek.....		1,500
Engelbretson Creek.....		1,500	Middleberry Branch.....		1,500
Everson Creek.....		1,500	Rock Branch.....		3,000
Fly Creek.....		1,500	Theobald Branch.....		1,500
French Creek.....	3,000		Williams Creek.....		1,500
Halvorson Creek.....		1,500	Willow Creek.....		1,500
Hegle Creek.....		1,500	Donaldson, Little Tamarack Creek.....		900
Herried Creek.....		1,500	Pickeral Creek.....		900
Joe Creek.....		1,500	Portage Creek.....		664
Johnson Creek.....		1,500	Spring Creek.....		493
Kittleson Creek.....		1,500	Tamarack Creek.....		1,200
Lakes Creek.....		1,500	Dausman, Meadow Spring Creek.....		1,500
Little Bear Creek.....		1,500	Potters Creek.....		3,000
Mattison Creek.....		1,500	Eagle, Jericho Creek.....		3,000
Nordhus Creek.....		1,500	Scuppernong Creek.....		3,000
Olson Creek.....		1,500	Eau Claire, Annie Creek.....		50
Peterson Branch.....		1,500	Apple Creek.....		50
Quarney Branch.....		1,500	Bear Grass Creek.....		800
Rat Coulee Creek.....		1,500	Beaver Creek.....		800
Samson Creek.....		1,500	Bessie Creek.....		50
Sheppard Creek.....		1,500	Black Creek.....		50
Skulley Creek.....		1,500	Brick Creek.....		50
Sletto Creek.....		1,500	Butternut Creek.....		50
Strums Creek.....		1,500	Charles Creek.....		50
Teppen Creek.....		1,500	Clear Creek, North Branch.....		800
Trump Creek.....		1,500	Clear Creek, South Branch.....		800
Upper Beaver Creek.....	3,000		Coon Creek, North Branch.....		800
Vossee Creek.....		1,500	Cranberry Creek.....		800
Welch Creek.....		1,500	Dale Creek.....		50
Bloomer, Beaver Creek.....		50	Dushane Creek.....		800
Big Pine Creek.....		50	Elm Creek.....		50
Birch Creek.....		50	Evergreen Creek.....		50
Bitney Creek.....		50	Five Mile Creek.....		800
Bobs Creek.....		50	Fly Creek.....		50
Conry Creek.....		50	Hazelnut Creek.....		50
Crank Creek.....		50	Hobart Creek.....		800
Crisman Creek.....		50			
Duncan Creek.....		50			
Gravonder Creek.....		50			
Hay Creek.....		50			
Heineman Creek.....		50			
Little Hay Creek.....		50			
McCann Creek.....		50			
Marquet Creek.....		50			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
<b>Wisconsin—Continued.</b>			<b>Wisconsin—Continued.</b>		
Eau Claire, Lily Creek .....		50	Hawkins, Burgess Creek .....		1,600
Little Beaver Creek .....		800	Main Creek .....		2,400
Little Elk Creek .....		800	Pine Creek .....		1,600
Little Niagara Creek .....		800	Stony Brook .....		800
Nine Mile Creek .....		800	Hillsboro, Baptist Creek .....		500
Park Creek .....		800	Cedar Creek .....		500
Pebble Creek .....		50	Happy Hollow Creek .....		500
Pipe Creek .....		50	Little Brook .....		500
Rest Creek .....		50	Oldfelts Creek .....		4,000
Rocky Creek .....		800	Trout Run .....		500
Sandie Creek .....		50	Warner Creek .....		500
Seven Mile Creek .....		800	Hixton, Beaver Creek .....		1,500
Sherman Creek .....		800	Curran Creek .....		700
South West Creek .....		50	Ellingson Creek .....		1,500
Taylor Creek .....		800	Hagen Creek .....		1,500
Twig Creek .....		50	Hoffman Creek .....		1,500
Wallace Creek .....		800	Holmes Creek .....		700
Walnut Creek .....		50	Judkin Creek .....		350
Wheaton Creek .....		800	Larson Creek .....		350
Willow Creek .....		50	Lowe Creek .....		700
Wolf Creek .....		50	Olson Creek .....		1,500
Eleva, Adams Creek .....		650	Pigeon Creek .....		1,500
Big Creek .....	1,300		Pine Creek .....		700
Bollinger Creek .....		650	Sly Creek .....		700
Little Creek .....		650	Steinseth Creek .....		1,500
Rock Creek .....		650	Tank Creek .....		700
Rosman Creek .....	1,300		Thompson Branch .....		350
Tollefson Creek .....		650	Trempealeau River, North Branch .....		1,050
Trout Creek .....	1,300		Trempealeau River, South Branch .....		1,050
Elkhart Lake, Mullet River .....		100	Iron Belt, Potatoe River, North Branch .....		3,200
Elk Mound, Chesapeake Creek .....		100	Kendall, Brainerd Creek .....		1,000
Elk Creek .....	1,050		Davis Creek .....		2,000
Paulson Creek .....		100	Foxes Creek .....		2,000
Peterson Creek .....		100	Wildse Creek .....		1,000
Elmwood, Cady Creek .....	1,050		Kewaunee, Kewaunee River .....		200
Decker Creek .....	350		Spring Creek .....		200
Gilbert Creek .....	1,050		Kilbourn, Corming Creek .....		1,500
Little Missouri River .....	1,050		Gilmore Creek .....		1,500
Night Creek .....	1,050		Gulch Creek .....		1,500
Plum Creek .....	1,050		Hulbert Creek .....		1,500
Porter Creek .....	700		Plainville Creek .....		1,500
Elroy, Seymore Creek .....	1,000		La Crosse, Big Creek .....		8,000
Fountain City, Bohris Valley Creek .....		1,050	Burns Creek .....		3,000
Eagle Valley Creek .....		1,050	Chipmunk Coulee Creek .....		9,000
Pipers Valley Creek .....		1,050	Coon Creek .....		1,500
Schaups Valley Creek .....		1,050	Rose Creek .....		1,000
Galesville, Bear Creek .....		1,050	Sand Creek .....		500
Beaver Creek, Branches of .....		2,000	Sand Lake Coulee Creek .....		500
Corrigans Creek .....		1,000	Seiler's pond .....		300
Dutch Creek .....		1,000	McCord, Omloff Creek .....		166
French Creek .....		2,000	Sanderson Creek .....		900
Grants Creek .....		1,000	Manitowoc, Fisher Creek .....		332
Hardies Creek .....		1,000	Kriwanek Creek .....		332
Tamarack Creek .....		2,000	Point River .....		332
Guys Mills, Bacon Creek .....	3,000		Marathon, Kennedy Creek .....		100
Glen Flora, Bear Creek .....	700		Mattoon, Red River, West Branch .....		600
Deer Tail Creek .....	700		Mellen, Browns Creek .....		1,600
Josie Creek .....	700		Cleveland Creek .....		800
Main Creek .....	700		Delene Creek .....		2,400
Skinner Creek .....	700		Earl Creek .....		1,600
Grand Marsh, White Creek .....		2,000	Fox Creek .....		800
Grand Rapids, Chester Creek .....		100	Happy Creek .....		1,600
Seven Mile Creek .....		3,100	Kings Creek .....		800
Spring Branch .....		100	Little Beaver Creek .....		1,600
Two Mile Creek .....		100			
Wakley Creek .....		100			
Green Bay, Bairds Creek .....		100			
Beaver Dam Creek .....		498			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
<b>Wisconsin—Continued.</b>			<b>Wisconsin—Continued.</b>		
Mellen, Mellen Creek.....		1,600	Menomonie, Rock Creek.....		1,500
Mirror Creek.....		1,600	Rush Creek.....		1,593
Silver Creek.....		1,600	Sand Creek.....		1,593
Willow Creek.....		1,600	Shafer Creek.....		1,593
<b>Menomonie, Adams</b>			Simondsons Creek.....		1,593
Creek.....		1,592	Smith Creek.....		1,500
Anderson Creek.....		1,500	Spring Creek.....		1,500
Annis Creek.....		1,592	Stoner Creek.....		1,500
Asylum Creek.....		1,500	Styers Creek.....		1,500
Beaver Creek.....		93	Thums Creek.....		1,593
Big Beaver Creek.....		1,500	Tiffany Creek.....		1,500
Big Elk Creek.....		3,000	Torgerson Creek.....		1,500
Big Hay Creek.....		1,500	Trout Creek.....		1,500
Big Meadow Creek.....		1,500	Upper Pine Creek.....		1,500
Big Missouri Creek.....		1,500	Valley View Creek.....		1,593
Big Otter Creek.....		1,500	Vance Creek.....		1,500
Biss Creek.....		1,500	Varney Creek.....		1,592
Blair Creek.....		1,500	Washburn Creek.....		1,500
Boland Creek.....		1,593	Wilson Creek.....		4,592
Bubbling Spring			Wilson Creek, North		
Creek.....		1,590	Branch.....		1,500
Cady Creek.....		1,500	Wolfs Creek.....		1,500
Clack Creek.....		1,500	Merrillan, Gearing Creek.....		4,500
Connors Creek.....		1,500	Halls Creek.....		900
Coon Creek.....		1,500	Van Herset Creek.....		600
Cranberry Creek.....		1,500	Millston, Covey Creek.....		650
Crosby Creek.....		1,590	Matchett Creek.....		1,300
Dahl Creek.....		1,500	Mattison Creek.....		650
Drowley Creek.....		1,500	Mill Creek.....		300
Dushane Creek.....		1,502	Pigeon Creek.....		1,300
Eau Galle River.....		4,500	Polly Creek.....		300
Eddy Creek.....		1,500	Pongratz Creek.....		650
Eighteen-Mile Creek.....		1,502	Robinson Creek.....		1,300
Elk Creek.....		93	Robinson Creek,		
Enams Creek.....		1,500	South Fork.....		650
Galloway Creek.....		1,500	Silver Creek.....		650
Gilbert Creek.....		3,093	Stony Creek.....		650
Hall Creek.....		1,500	Trout Creek.....		650
Hay Creek.....		1,592	<b>Mondovi, Bennett Val-</b>		
Hay River, North			ley Creek.....		1,500
Fork.....		3,000	Cooks Creek.....		1,500
Hay River, South			Davis Creek.....		3,000
Fork.....		3,000	Elk Creek.....		4,500
Hobbs Creek.....		1,092	Farrs Creek.....		1,500
Honey Creek.....		1,000	Gilman Valley Creek.....		3,000
Iron Creek.....		1,000	Hadley Creek.....		1,500
Irving Creek.....		1,093	Pratt Creek.....		3,000
Jesse Creek.....		1,092	Rast Creek.....		1,500
Johns Creek.....		1,000	Spildies Creek.....		1,500
Johnson Creek.....		1,093	Turner Valley Creek.....		1,500
Kings Creek.....		1,093	Ulbergs Creek.....		1,500
Knights Creek.....		1,093	Neenah, Klinkes Spring		
Lindsay Creek.....		1,000	Creek.....		100
Little Beaver Creek.....		1,000	Sorensens Creek.....		100
Little Elk Creek.....		1,000	New Libson, Hoton		
Little Missouri Creek.....		1,000	Creek.....		2,000
Little Otter Creek.....		1,000	Macomber Creek.....		1,200
Little Sand Creek.....		1,000	White Creek.....		1,200
Losby Creek.....		1,000	Norwalk, Coals Valley		
Louis Creek.....		1,000	Creek.....		1,000
Lower Pine Creek.....		2,000	Otis, Beade Creek.....		650
Lynch Creek.....		1,000	McCloud Creek.....		1,950
McCarthy Creek.....		1,093	Ox Bone Creek, Up-		
Maves Creek.....		1,000	per.....		1,950
Miller Creek.....		1,000	Prairie River.....		3,250
Mud Creek.....		1,000	Silver Creek.....		1,300
Otter Creek.....		93	Smith Creek.....		1,950
Owen Creek.....		1,000	Park Falls, Aucker		
Palmer Creek.....		1,000	Creek.....		800
Parker Creek.....		1,000	Beaver Creek.....		800
Poppo Creek.....		1,000	Butternut Creek.....		800
Proper Creek.....		1,092	Coolidge Creek.....		800
Quaders Creek.....		1,500	Deer Creek.....		800
Quelling Creek.....		1,592	Dyerimple Creek.....		800

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			Wisconsin—Continued.		
Park Falls, Flood Creek.....		800	Rice Lake, Sugar Creek.....		800
Gibson Creek.....		800	Thirty-three Creek.....		1,600
Hamilton Creek.....		800	Tuscobia Creek.....		800
Hartle Creek.....		800	Richland Center, Ash Creek, East Branch.....		3,000
Hilgart Creek.....		800	Ash Creek, West Branch.....		1,500
Little Betsey Creek.....		800	Bear Creek, Phelan Branch.....		3,000
Mensie Creek.....		800	Center Creek.....		1,500
Meyers Creek.....		800	Ewers Creek.....		1,500
Miller Creek.....		800	Fancy Creek.....		3,000
Muncy Creek.....		800	Fox Creek.....		1,500
Neuman Creek.....		800	Grinsel Creek.....		1,500
Nine Mile Creek.....		800	Hawkins Creek.....		1,500
Passner Creek.....		800	Hoosier Creek.....		1,500
Patterson Creek.....		800	Little Bear Creek.....		3,000
Pinkerton Creek.....		800	Little Willow Creek.....		1,500
Rabbit Creek.....		800	Longs Branch.....		1,500
Saylor Creek.....		800	Mothers Creek.....		1,500
Shaw Creek.....		800	Pine River, East Branch.....		3,000
Six Mile Creek.....		800	Pine River, West Branch.....		3,000
Smith Creek.....		800	Rocky Branch.....		1,300
Spring Creek.....		800	School Section Hollow Creek.....		1,500
Spring Steel Creek.....		800	Soules Creek.....		1,500
Steinaucher Creek.....		800	Tormey Creek.....		1,500
Swamp Creek.....		800	Will Creek, Branch of Willow Creek, Jag-wish Hollow Branch.....		1,500
Parrish, Prairie River.....		300	Sauk City, Blums Creek.....		3,000
Pembine, Pemberry Creek.....		1,800	Dunlap Creek.....		3,000
Pemene Bou Wou.....		1,200	Otter Creek.....		3,000
Pemence Creek.....		1,000	Sheboygan, Milwaukee River, North Branch.....		498
Phelps, Hay Meadow Creek.....		900	Onion River.....		498
Muskrat.....		900	Oosten Creek.....		166
Twin Creek.....		100	Spring Farm Creek.....		166
Plymouth, Onion River, West Branch.....		300	Town Scott Creek.....		498
Pound, Bowers Creek.....		100	Trasey Spring Creek.....		166
Rhineland, Bearskin Creek.....		1,300	Sheboygan Falls, Milwaukee River, North Branch.....		2,000
Eight Mile Creek.....		100	Mullett Creek.....		200
Four Mile Creek.....		100	Rhine Creek.....		600
Goodegast Creek.....		100	Solon Springs, Brule River.....		800
Indian Creek.....		100	Spring Bank Creek.....		800
Jenny Weber Creek.....		100	Sparta, Ash Creek.....		1,500
Lake Creek.....		100	Beaver Creek.....		500
Rice Lake, Angles Creek.....		800	Big Creek.....		1,000
Beaurie Creek.....		1,600	Big Big Creek.....		900
Cobb Creek.....		1,600	Bruders Creek.....		600
Cranberry Creek.....		1,600	Bush Prairie Creek.....		600
Deitz Creek.....		800	Camp Creek.....		300
Devils Creek.....		2,400	Cannon Valley Creek.....		600
French Creek.....		800	Clear Creek.....		500
Hay Creek.....		1,600	Coles Valley Creek.....		600
Hemlock Creek.....		1,600	Fish Creek.....		600
Kenyon Creek.....		1,600	Flora Dell Creek.....		300
Kettle Creek.....		800	Hughes Creek.....		600
Lawler Creek.....		1,600	Jewell Creek.....		600
Little Bear Creek.....		1,600	Leverich Creek.....		300
Little Tuscobia Creek.....		800	Little Beaver Creek.....		600
Long Lake Creek.....		1,600	Little Big Creek.....		1,100
Lost Creek.....		800	Little Flora Creek.....		600
Meadow Creek.....		800	Little La Crosse River.....		900
Moon Creek.....		800	Little Silver Creek.....		500
Mud Creek.....		800	Lyon Valley Creek.....		600
Overby Creek.....		1,600	Moseley Brook.....		300
Pekegamo Creek.....		1,600	Pauls Creek.....		300
Pine Creek.....		1,600	Pleasant Valley Creek.....		600
Rice Creek.....		800			
Rock Creek.....		1,600			
Savage Creek.....		1,600			
Silver Creek.....		1,600			
Spoon Creek.....		800			
Spring Creek.....		1,600			
Spur Nine Creek.....		1,600			
Sucker Creek.....		800			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.
<b>Wisconsin—Continued.</b>			<b>Wisconsin—Continued.</b>		
Sparta, Prescott Creek.....		500	Tomahawk, Little Pine Creek.....		1,950
Prince Creek.....		600	Little Somo River.....		100
Purdy Valley Creek.....		600	Pine Creek, South Branch.....		1,300
Reeder Creek.....		300	Rocky Creek.....		1,300
Rings Creek.....		300	Squaw Creek.....		1,300
Rogers Creek.....		600	Trempealeau, Beaver Creek.....		4,500
Sand Creek.....		600	Beaver Creek, North Branch.....		4,500
Shalk Creek.....		300	Beaver Creek, South Branch.....		4,500
Snow Creek.....		300	Bohris Valley Creek.....		1,050
Spencer Creek.....		600	Crystal Spring Pond.....		1,600
Squaw Creek.....	1,500		Crystal Valley Creek.....		4,500
Stillwell Creek.....		600	Dutch Creek.....		4,500
Strous Creek.....		300	Fox Creek.....		1,050
Swamp Creek.....		500	French Creek.....		4,500
Tarr Creek.....	3,000		Holcomb Valley Creek.....		1,050
West Beaver Creek.....		600	Kerrigan Valley Creek.....		4,500
Winterfield Creek.....		300	Norway Cooley Creek.....		4,500
Winters Brook.....		600	Pine Creek.....		1,050
<b>Taylor, Curran Cooley Creek.....</b>			Tamarack Creek.....		1,050
Erickson Creek.....		1,500	Turtle Lake, Beaver Creek.....		2,400
French Creek.....		1,500	Turtle Creek.....		2,400
Helle Creek.....		1,500	Warrens, Beltz Creek.....		600
Holmes Creek.....		1,500	Brandy Creek.....		600
Litson Creek.....		1,500	Castle Rock Creek.....		600
Lowe Creek.....		1,500	Clear Creek.....		2,000
Nichols Creek.....		1,500	Daupe Creek.....		600
Pile Cooley Creek.....		3,000	Fish Creek.....		1,600
Pine Creek.....		3,000	Harp Creek.....		600
Sharp Creek.....		3,000	La Crosse River, North Branch.....		3,000
Skutley Creek.....		1,500	Lowrey Creek.....		1,000
Spaulding Creek.....		1,500	Mill Creek.....		600
Sprouds Creek.....		3,000	Millston Creek.....		2,000
Vossa Cooley Creek.....		1,500	Patterson Creek.....		2,000
<b>Tomah, Allen Creek.....</b>			Poff Creek.....		600
Bear Creek.....		1,400	Rudd Creek.....		1,600
Blair Creek.....		900	Second Creek.....		600
Brandy Creek.....		1,000	Whiskey Creek.....		2,600
Clear Creek.....		500	Wyman Creek.....		1,900
Clifton Creek.....		600	Waukesha, Bidwells Creek.....		1,500
Coles Creek.....		1,400	Pebble Brook.....		3,000
Council Creek.....		1,900	Spring Run.....		1,500
Dandy Creek.....		900	Stone Creek.....		4,500
Deer Creek.....		800	Wolf Creek.....		3,000
Dixon Creek.....		1,400	Wrights Creek.....		3,000
Drowatzky Creek.....		300	Waupaca, Emmons Creek.....		664
Elm Creek.....		500	Pearl Creek.....		498
Finger Creek.....		900	Radley Creek.....		996
Fish Creek.....		900	Wausau, Black Creek.....		1,300
Flag Creek.....		1,000	Bull Junior Creek.....		1,300
Indian Creek.....		900	Bull Sampson Creek.....		1,950
Jennings Creek.....		1,900	Four Mile Creek.....		1,300
La Flore Creek.....		1,400	Kane Creek.....		1,300
Mill Creek.....		1,400	Little Embarrass River.....		650
Mudd Creek.....		1,400	Little Rib River.....		1,300
Nelson Creek.....		900	Little Sandy Creek.....		1,300
Pigeon Creek.....		900	Pine River, North Branch.....		1,300
Prairie Farm Creek.....		900	Sand Creek.....		1,300
Sand Creek.....		1,400	Silver Creek.....		1,300
Silver Creek.....		1,900	Weirgor, Maple Creek.....		1,600
Sparta Creek.....		1,500	Spring Brook.....		2,400
Squaw Creek.....		500	Wheeler, Blank Creek.....		350
Swamp Creek.....		900	Little Otter Creek.....		700
Tarr Creek.....		1,400	Otter Creek.....		700
Turtle Creek.....		900			
Wolf Creek.....		900			
Wrights Creek.....		900			
<b>Tomahawk, Beaver Creek.....</b>					
Berry Creek.....		200			
Big Pine Creek.....		1,300			
Bush Creek.....		1,950			
Gut Creek.....		100			
Hay Creek.....		650			
Kuehling Creek.....		1,500			
		650			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## BROOK TROUT—Continued.

Disposition.	Fry and eggs.	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Wisconsin—Continued.			Wisconsin—Continued.		
Whitehall, Big Slough Creek.....		1,500	Winter, Dead Mans Creek.....		2,400
Bruce Creek.....		1,500	Wyoming:		
Carpenter Creek.....		1,500	Aladdin, Hay Creek, North Fork.....		200
Chimney Rock Creek.....		3,000	Basin, Brokenback Lake.....		1,600
Dagget Creek.....		1,500	Beulah, Long Branch.....		100
Elk Creek.....		3,000	Cody, Eleanor Creek.....		7,000
Fitch Coulee Creek.....		1,500	Shoshone River, North Fork.....		10,000
Fly Creek.....		1,500	Shoshone River, South Fork.....		10,000
Fuller Creek.....		1,500	Dayton, Sucker Creek, Upper.....		800
Golden Creek.....		1,500	Tongue River, South Fork.....		800
Irvin Creek.....		1,500	Dubois, Warm Spring Creek.....		20,000
Johnson Creek.....		1,500	Evanston, Bear River.....		1,500
Lake Coulee Creek.....		1,500	Greybull, Beaver Creek.....		5,250
Nelton Creek.....		1,500	Cedar Creek.....		4,250
North Branch Creek.....		1,500	Willett Creek.....		5,000
Olsons Creek.....		1,500	Laramie, Hundred Springs Lake.....		200
Pike Creek.....		1,500	Klein Reservoir.....		1,500
Plumb Creek.....		1,500	Lusk, Rawhide Creek.....		800
Russel Creek.....		1,500	Newcastle, Stockade Beaver Creek.....		400
Shugurud Creek.....		1,500	Ranchester, Lake Creek Tongue River, North Fork.....		10,000
Skimmerhorn Creek.....		1,500	Willow Creek.....		6,000
Sleepy Creek.....		1,500	Saratoga, Battle Creek.....		3,000
Solfest Creek.....		1,500	Brush Creek and branches.....		20,000
Van Sickle Creek.....		1,500	Calf Creek.....		5,000
Wilton, Adrian Creek.....		1,000	Campbell Reservoir.....		4,000
Beach Creek.....		500	Cedar Creek and branches.....		20,000
Dorset Creek.....		500	Cottonwood Creek.....		4,000
Dougherty Creek.....		1,000	Cow Creek.....		10,000
Farmers Creek.....		500	Encampment Creek.....		4,000
Finnean Creek.....		1,000	Jack Creek and branches.....		22,000
Gallaghers Creek.....		500	Lake Creek and branches.....		10,256
Hibbard Creek.....		1,500	Lily Pond.....		4,000
Hubbard Creek.....		1,000	Low Creek.....		4,000
Huehl Creek.....		1,500	Magnolia Pond.....		4,000
Nathan Creek.....		1,000	Pass Creek, Upper and Lower.....		13,000
Posey Creek.....		1,500	Rose Creek.....		4,000
Riordan Creek.....		1,500	Savery Creek.....		2,000
Schultz Creek.....		1,000	Slater Creek.....		3,000
Sinks Creek.....		1,000	Spring Creek and branches.....		42,000
Slaten Creek.....		1,500	Stamp Mill Pond.....		3,000
Smith Creek.....		1,000	Sheridan, Bull Creek.....		5,000
Stratman Creek.....		2,000	Fool Creek.....		6,000
Summerfield Creek.....		1,500	Kemp Creek.....		8,000
Uischner Creek.....		1,000	Lick Creek.....		8,000
Waige Creek.....		1,500	State fish commission.....	* 50,000	
Webb Creek.....		1,000	Thermopolis, Owl Creek.....		2,800
Winegar, Ash Creek.....		100	Warrenton, Lone Tree Creek.....		1,500
Beaver Brook.....		700			
Carlins Creek.....		100			
Fur Creek.....		100			
Iron Creek.....		100			
Kimble Creek.....		100			
Otter Creek.....		100			
Rileys Brook.....		700			
Streeters Creek.....		700			
Winnemoujou, Bay Lake.....		1,600			
Big Lake.....		1,600			
Brule River.....		3,200			
Cutler Creek.....		1,600			
Hart Lake.....		1,600			
Hungry Run.....		1,600			
Lake Florence.....		800			
Little Brule River.....		1,600			
Long Lake.....		2,400			
Lucius Lake.....		1,600			
Nebagamon River.....		1,600			
Wheaton Creek.....		800			
			Total b.....	{ 5,057,650 * 635,000 }	7,576,817

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.<sup>b</sup> Lost in transit, 23,550 fry, 35,200 fingerlings.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## SMELT.

Disposition.	Eggs.	Fry.	Disposition.	Eggs.	Fry.
Maine:			New York—Continued.		
Branch Pond, Branch Pond.....		10,000,000	Willsborough, Warm Pond.....		500,000
Green Lake, Green Lake.....		2,000,000	Vermont:		
Massachusetts: West Barnstable, Neck Pond.....		500,000	Brattleboro, South Lyndonville, State fish commission.....	10,000,000	500,000
Michigan:			Newport, Salem Pond.....		500,000
Big Bay, applicant.....	2,000,000		Petersburg, Big Pond.....		500,000
Sault Ste. Marie, State fish commission.....	10,000,000		Roxbury, State fish commission.....	5,000,000	
Williamsburg, Scofield Brook.....	2,000,000		Wilmington, Haystack Lake.....		500,000
New York:			Total.....	36,000,000	15,000,000
Port Henry, Lake Champlain.....	5,000,000				
Raquette Lake, Lake Kora.....	2,000,000				

## GRAYLING.

Idaho: Preston, Bear River.....		50,000	Montana—Continued.		
Michigan: Grayling, Au Sable River.....	100,000	25,000	Whitehall, Jefferson River.....		42,500
Montana:			Wyoming:		
Anaconda, State fish commission.....	2,300,000		Laramie, State fish commission.....	250,000	
Butte, applicant.....	700,000		Sheridan, State fish commission.....	150,000	
Deborgia, Bear Lake.....		25,500	Total.....	3,500,000	1,868,000
Ennis, Madison Lake.....		625,000			
Madison River.....		1,000,000			
Odell Creek.....		100,000			

## CRAPPIE.

Disposition.	Fingerlings, yearlings, and adults.	Disposition.	Fingerlings, yearlings, and adults.
Alabama:		Alabama—Continued.	
Abbeville, Norman Lake.....	100	Madison, Cold Spring Lake.....	100
Andalusia, Doty's pond.....	80	Oneonta, Mill Creek.....	150
Knox's pond.....	80	Opp, Weaver's pond.....	40
Rankin's pond.....	40	Petrys, Duke's pond.....	50
Thompson's pond.....	80	Prattville, Golson's pond.....	40
Anniston, Cane Creek.....	200	Goodson Mill Pond.....	80
Choccolocco Creek.....	150	Rice's pond.....	80
Bessemer, Porter's pond.....	80	Walls Pond.....	80
West Lake.....	320	Unionville, Eley's pond.....	40
Camden, Bonner's lake.....	50	Valley Head, Crane's pond.....	50
Capps, Alexander's pond.....	50	Arkansas:	
Comer, Pruett Pond.....	40	Graysonia, Antoine River.....	200
De Armanville, Hillabee Creek.....	100	Hope, Spring Lake.....	135
Morris Mill Pond.....	50	Nashville, Coleman's pond (A).....	45
Dothan, Baizemore Mill Pond.....	150	Coleman's pond (B).....	50
Malone Mill Pond.....	150	St. Francis River Bridge, St. Francis River.....	225
Ward Pond.....	100	Colorado: Arlington, Moseley's pond.....	300
Eufaula, Comer's pond.....	40	Florida:	
Ogletree's pond.....	40	Lake City, Duval Lake.....	250
Gadsden, Big Canoe Creek.....	150	Madison, Lake Rachel.....	375
Sibert Mill Pond.....	100	Tallahassee, Silver Trout Lake.....	125
Goodwater, Jayner Lake.....	40	Georgia:	
Whitley's pond.....	40	Athens, Spencer's pond.....	125
Huntsville, Brahan Spring Lake.....	150	Barwick, Massey's pond.....	125
Jackson, Chastain Lake.....	50	Bowdin, Indian Creek.....	250
Jemison, Cobb's pond.....	100	Buena Vista, Hollis Lake.....	375
Linden, Hinson's pond.....	50	Taylor's pond.....	250
Livingston, Big Fin Pond.....	50	Conyers, Ivey's pond.....	125
Lowndesboro, Dickson's pond.....	100		



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## CRAPPIE—Continued.

Disposition.	Finger- lings, yearlings, and adults.	Disposition.	Finger- lings, yearlings, and adults.
Georgia—Continued.		Indiana—Continued.	
Crawfordville, Nunn Pond.....	125	Lake Cicott, Lake Cicott.....	375
Douglas, Peterson's pond.....	250	Linsburg, Smiley's pond.....	125
Fairburn, Wynn Pond.....	250	Plymouth, Pretty Lake.....	375
Hahira, Miley's pond.....	250	Sunman, Stahley's pond.....	150
Kennesaw, Austin's pond.....	125	Troutman's pond.....	150
Nunez, Forest Glen Pond.....	125	Terre Haute, Sandberg's pond.....	150
Oakum, Rockdale Lake.....	250	Vincennes, Friez's lake.....	150
Ocilla, Larry Lake.....	250	Lake Mont Clare.....	150
Pearson, Guest's mill pond.....	500	Iowa:	
Pidcock, Byrd Pond.....	125	Bellvue, Mississippi River.....	a 1,729,100
Cutler Pond.....	125	Boonville, Reiman's pond.....	250
Quitman, Blue Pond.....	250	Davenport, Vanderveer Park Lake.....	200
Goose Pond.....	250	Eldora, Iowa River.....	4,500
Stevens Pottery, Bloodworth's pond.....	125	Elk Horn, McKinley Pond.....	250
Stillmore, Warren's pond.....	125	Exira, Box Elder Lake.....	250
Sumner, Fowler's pond.....	250	Highland View Pond.....	250
Swainsboro, Deer Lake.....	250	Fairfield, Fryman's pond.....	500
Valdosta, Cherry Lake.....	375	Lime Springs, Upper Iowa River.....	9,200
Fly Pond.....	250	North McGregor, Mississippi River.....	a 260,500
Soldier Lake.....	375	Onawa, Blue Lake.....	3,000
Willacoochee, Paulk's pond.....	250	Steamboat Rock, Iowa River.....	4,500
Vickers's pond.....	250	Story City, Lake Comar.....	250
Illinois:		Kansas:	
Apple River, Apple River.....	2,000	Cherryvale, Hite's pond.....	100
Belleville, Dewey Club Lake.....	400	O'Leary's pond.....	100
Fern Glen Lake.....	200	Fredonia, Rainbow Lake.....	100
Glen Addie Lake.....	100	Mound City, Adams's pond.....	100
Heineman Lake.....	400	Seneca, Anthony Farm Pond.....	500
Oakdale Lake.....	200	Welda, Welda Lake.....	500
Belvidere, Kishwaukee River.....	8,250	Kentucky:	
Benton, Coal Company Pond.....	200	Bardstown, Spring Pond.....	100
Shirley Pond.....	300	Benton, Dycus's pond.....	50
Bloomington, Heafers Pond.....	200	Carlisle, Sampson's pond.....	125
Carbondale, England Lake.....	200	Chilesburg, Barn Pond.....	125
Maple Hill Lake.....	300	Sycamore Pond.....	125
Thompson Lake.....	300	Connors Station, Cates Lake.....	300
Coulterville, Adams Park Lake.....	100	Corbin, Laurel River.....	300
Illinois Central Lake.....	200	Crab Orchard, Crab Orchard Lake.....	300
Council Hill, Apple River.....	1,000	Silver Lake.....	100
Du Quoin, Majestic Lake.....	300	Danville, Caldwell Lake.....	100
Edwardsville, Le Claire Lake.....	250	Hampton Pond.....	200
Galesburg, Lake Rice.....	300	Lee's pond.....	100
Gibson City, Strata Lake.....	200	Eminence, Beechwood Pond.....	125
Golconda, Spring Lake Pond.....	150	Nuttall's pond.....	150
Hillsboro, Woodland Lake.....	100	O'Bryant Pond.....	125
Hudgens, Crystal Springs Lake.....	1,000	Ewington, Atkinson's pond.....	125
Kell, Jerseydale Pond.....	125	Farmers, Pond Number One.....	125
Lena, Mammoser Lake.....	800	Georgetown, Hall's pond.....	375
McLeansboro, Sayer's pond.....	100	Glasgow, Dean's pond.....	125
Meredosia, Illinois River.....	a 108,030	Lee's pond.....	125
Meredosia Bay.....	a 6,400	Greendale, Crenshaw's pond.....	125
Mount Vernon, Piper's pond.....	100	Hemp Ridge, Jeffere Creek.....	300
Napierville, Du Page River.....	500	Henderson, Barret's pond.....	50
New Douglas, Shady Grove Lake.....	125	Cherry Hill Pond.....	100
Nora, Apple River.....	2,000	Hickman, Blue Pond.....	100
O'Fallon, Cottonwood Lake.....	200	Hamby Pond.....	100
Pleasant Plains, Brown's pond.....	100	Hopkinsville, Oak Grove Pond.....	100
Polo, Pine Creek.....	5,900	Irvine, Twin Pond.....	200
Rockford, Rock River.....	7,200	Julien, Howell's pond.....	100
Scales Mound, Apple River.....	1,200	La Center, Hinkle's pond.....	50
Stronghurst, Fort Lake.....	200	Terrell Pond.....	50
Teutopolis, College Pond.....	250	La Grange, Irwin's pond.....	150
Thompsonville, Blue Grass Pond.....	100	Lexington, Reservoir No. 4.....	450
Warren, Apple River.....	800	Madisonville, Harmer Pond.....	100
Warsaw, Lake Melvina.....	200	Parker Pond.....	50
Waterloo, Fountain Pond.....	100	Maysville, Owens's pond.....	150
Western Springs, Vaughan's lake.....	100	Morton, Gatlin's pond.....	100
Indiana:		Nicholasville, Hooverhurst Pond.....	100
Anderson, Spring Lake.....	125	Richardson's pond.....	100
Brazil, Big Deer Lick Pond.....	150	Paducah, Terry's pond.....	50
Crawfordsville, Home Lodge Pond.....	125	Paint Lick, Griffith Pond.....	200
Hillsboro, Lake Levi.....	125	Paris, Valley Forge Pond.....	150
Indianapolis, Eagle Creek.....	375	Ryland, Ware's pond.....	150
White River.....	375	Shelbyville, Clear Creek.....	300

a Rescued from overflowed lands and restored to original waters.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## CRAPPIE—Continued.

Disposition.	Finger- lings, yearlings, and adults.	Disposition.	Finger- lings, yearlings, and adults.
<b>Kentucky—Continued.</b>		<b>Mississippi—Continued.</b>	
Stamping Ground, North Elkhorn River.....	375	Chunky, McGee's pond.....	35
Stanford, Ballard's pond.....	200	Clinton, Thompson Pond.....	40
Vine Grove, Cow Lot Pond.....	125	Corinth, Estes's pond.....	35
Hickory Pond.....	125	Kemper Lake.....	80
Mill Creek.....	375	Shearon Lake.....	120
Otter Creek.....	375	Spring Lake.....	80
Waddy, Waddy Pond.....	100	Surratt Lake.....	80
Walton, Gaines's pond.....	150	Crystal Springs, Blenkston's pond.....	35
Whitesburg, Fields's pond.....	100	Bridges Lake.....	70
<b>Louisiana:</b>		Chataqua Lake.....	105
Bastrop, Anderson's lake.....	80	Ervin's pond.....	35
Church Point, Daigle's pond.....	35	Scott Lake.....	35
Eros, Jackson Parish Lake.....	150	Willow Pond.....	35
Gilbert, Gilbert's pond.....	40	Edwards, Askew's pond.....	35
Gloster, Brinkley's pond.....	315	Harris Pond.....	105
Hammond, Snell Creek.....	100	Fayette, Cadillac Pond.....	30
Iota, Henry's pond.....	70	Kraus's pond.....	60
Minden, McDonald Pond.....	100	Liddell's pond.....	60
Orphans Lake.....	150	Smith's pond.....	60
Natchitoches, Chaplain Lake.....	135	Florence, Steer Pond.....	50
Scarborough's lake.....	140	Forest, Johns Pond.....	40
Pearl River, Will's pond.....	35	Georgetown, Lake Bovard.....	70
Port Hudson, Treagle's pond.....	30	Grenada, Pearson's pond.....	70
Ruston, Carroll Pond.....	70	Hazlehurst, Ellis Lake.....	70
Shamrock, Cassady's pond.....	100	Lake Hazle.....	105
Maryland: Bladensburg, Goodloe's pond.....	35	Lucky Lake.....	35
Massachusetts: Tolland, Big Casino Pond.....	200	Sandy Point Pond.....	35
<b>Michigan:</b>		Highlandale, Jones's pond.....	30
Clyde, Horne Lake.....	400	Holcomb, Bridger's pond.....	60
Doster, Pine Lake.....	400	Holly Springs, Hurdle Lake.....	40
Farwell, Johnny Lake.....	125	Houston, Fair Lake.....	120
Pond Lake.....	100	Irene, Butler's pond.....	35
Jackson, Big Portage Lake.....	400	Guy's pond.....	70
Vandercook & Brown Lake.....	800	Hillsdale Lake.....	70
Lake, Crooked Lake.....	250	Jackson, Bailey Lake.....	105
Marenisco, Lake Gogebic.....	150	Club Lake.....	70
Napoleon, Stony Lake.....	400	Mill Run Lake.....	70
Pentwater, North Ox Bow Lake.....	100	Tooles Cut Off Lake.....	105
Rose Center, Geer Lake.....	400	Kilnrichael, Shelton's pond.....	30
North Buckhorn Lake.....	400	Knoxville, Cobb's pond.....	60
Town Line Lake.....	400	Norman's pond.....	60
Twin Lake, Mid Lake.....	100	Kosciusko, Bailey Lake.....	160
<b>Minnesota:</b>		Cain's pad.....	40
Homer, Mississippi River.....	a 692, 140	Rimmer's pond.....	40
Lanesboro, Root River.....	200	Lamar, Cedar Lake.....	70
Randolph, Bilsby Lake.....	600	McDonald's pond.....	35
<b>Mississippi:</b>		Laurel, Culberth Lake.....	105
Aberdeen, Duck Pond.....	70	Drennan's pond.....	35
Menko Pond.....	35	Meador's pond.....	80
Paine's pond.....	35	Southland Pond.....	70
Quofoloma Lake.....	70	Travis Pond.....	140
Robert's pond.....	70	Louisville, Creosote Pond.....	160
Rose Hill Lake.....	70	Fishing Club Lake.....	105
Round Lake.....	70	McGee Pond.....	35
Ackerman, Buck's pond.....	70	Mitchell's pond.....	100
Hemphill's pond.....	100	McCool, Gum Pond.....	50
Sheedy's pond.....	70	Macon, Hill Pond.....	40
Amory, Bett's pond.....	80	Thompson's pond.....	80
Lake Julie.....	80	Mantee, Valley Pond.....	150
Mayfield's lake.....	80	Meridian, Hamilton Lake.....	70
Bay Springs, Bay Pond.....	35	Waterworks Ponds.....	105
Bay Lily Pond.....	35	Mize, Bryant's pond.....	50
Johnston's pond.....	35	Morton, Bushing's pond.....	35
Braxton, Willow Pond.....	35	Moselle, Rumph's pond.....	70
Brookhaven, Smith's pond.....	35	Natchez, Castleman Lake.....	60
Calhoun City, Macon's pond.....	40	Ogden Lake.....	60
Smith's pond.....	80	Stewart's pond.....	30
Canton, Caldwell Lake.....	70	Sunnyside Pond.....	30
Luckett Pond.....	70	Swayze's pond.....	30
Lutz Lake.....	70	Wilderness Pond.....	30
Oil Mill Pond.....	70	Wilson's pond.....	30
Centerville, Hodges Lake.....	60	Okolono, Okolono Pond.....	160
		Olive Branch, McCargo's pond.....	105

a Rescued from overflowed lands and restored to original waters.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## CRAPPIE—Continued.

Disposition.	Finger- lings, yearlings, and adults.	Disposition.	Finger- lings, yearlings, and adults.
<b>Mississippi—Continued.</b>		<b>Missouri—Continued.</b>	
Oxford, Beard's pond.....	35	Palmyra, Bay de Charles.....	200
Pachuta, Morgan Lake.....	70	Parkville, Scarritt's pond.....	100
Pheba, Cliett's pond.....	30	Richland, Gasconade River.....	400
Cochran Pond.....	30	Rocheport, Petrie's pond.....	100
Melton's pond.....	30	Saginaw, Bolen Lake.....	200
Ritch's pond.....	30	St. Clair, Reymer's pond.....	150
Willow Bend Pond.....	30	Stc. Genevieve, Wilder Pond.....	200
Pocahontas, Cotton Valley Pond.....	35	St. Louis, Goehrung's lake.....	150
Pontotoc, Orchard Lake.....	70	St. Louis, Poupenny Lake.....	500
Patterson's pond.....	70	Savannah, McFadden Lake.....	200
Port Gibson, Magnolia Pond.....	30	South Greenfield, Limestone Creek.....	300
Prentiss, Lily Pond.....	80	Turnback Creek.....	300
Raymond, Estic Pond.....	35	Washburn, Crim's pond.....	100
Saltillo, Parr's pond.....	80	Windsor, Wilkerson Park Lake.....	400
Sardis, Legge's pond.....	40	Wyaconda, Wyaconda Lake.....	250
Scoba, East Pond.....	40	<b>Nebraska:</b>	
Johnson's pond.....	40	Hardy, Rainey Pond.....	100
South Pond.....	40	Hartington, Bow Creek.....	250
Shuqualak, Barn Pond.....	80	Spencer, Jerman's pond.....	250
Constantine Pond.....	80	Virginia, Virginia Lake.....	150
Henderson's pond (A).....	40	Wayside, Baird's pond.....	250
Henderson's pond (B).....	40	Bobemien Creek.....	250
Jones's pond.....	120	Kitchens Pond.....	125
Lake Pond.....	80	<b>New Jersey:</b>	
McArthur's pond.....	40	Millville, Union Lake.....	400
Mill Pond.....	80	Newton, Swartswood Lake.....	400
Steele's pond.....	80	<b>New York:</b>	
Wigwam Pond.....	40	Buffalo, Green Lake.....	375
Smith, Marshal Lake.....	80	Cuba, Cuba Lake.....	625
Stratton, Popular Pond.....	35	Gloversville, Lily Lake.....	375
Summit, Railroad Lake.....	105	Round Lake, Round Lake.....	375
Tishomingo, Camp Spring Lake.....	35	<b>North Carolina:</b>	
Toomsaba, Hurtt's pond (A).....	35	Biscoe, Coggins's pond.....	125
Hurtt's pond (B).....	70	Burlington, Haw River.....	250
Tunica, Kinney Lake.....	70	Murray Mill Pond.....	250
Tylertown, Rimes's pond.....	35	Piedmont East Lake.....	250
Willis's pond.....	35	Henderson, Parker's pond.....	250
Union, Day Pond.....	70	Maysville, New River.....	375
Reagan's pond.....	35	Mount Airy, Fairchild's pond.....	125
Vicksburg, Scott Lake.....	60	Laurel Bluff Pond.....	250
Wahalak, Persons Pond.....	40	McBride's pond.....	250
Washington, Campbell's pond.....	50	Rockingham, Marks Creek.....	250
Waynesboro, Cochran's pond.....	40	Roseboro, Great Swamp Pond.....	250
Cole's pond.....	80	Wilson, Grantham Pond.....	250
West-King Pond.....	80	<b>North Dakota:</b>	
West Point, Coleson's pond.....	70	Devils Lake, Devils Lake.....	600
Deanes Brothers Lake.....	105	St. John, Byrnes Lake.....	200
Hamlin's pond (A).....	70	Carpenter Lake.....	200
Hamlin's pond (B).....	70	Dion Lake.....	200
Wiggins, Beaver Dam Pond.....	150	Fish Lake.....	200
Woodville, Beckham's pond.....	30	Gordon Lake.....	200
Kaigler's pond.....	30	Jarvis Lake.....	200
Lake Bonniemead.....	30	Krooks Lake.....	200
Tucker's pond.....	30	Long Lake.....	200
<b>Missouri:</b>		Mill Lake.....	200
Alma, Deichoff Pond.....	150	Oak Lake.....	200
Blackburn, Chicago & Alton Pond.....	200	Perdy Lake.....	200
Bunceton, Petite Saline Creek.....	400	Schnavly Lake.....	200
Cabool, Graves's pond.....	100	Taylor Lake.....	200
Doniphan, Miller's pond.....	100	Walker Lake.....	200
Excelsior Springs, Henry's west pond.....	100	<b>Ohio:</b>	
Grandview, Blue Ridge Pond.....	200	Batavia, Little Miami River, East Fork.....	300
Spring Lake Pond.....	200	Belleville, Gatton's lake.....	125
Joplin, Walnut Ridge Pond.....	150	Columbus, Big Walnut Creek.....	375
La Belle, Lake Park.....	400	Geauga Lake, Geauga Lake.....	625
Lamar, Gregory Lake.....	400	Georgetown, White Oak Creek.....	300
Mallett Lake.....	300	Lawshe, Brush Creek.....	300
Lebanon, North End Pond.....	100	Lima, Watkins Pond.....	150
Mill Spring, College Lake.....	100	Loveland, Little Miami River.....	300
Neosho, Cedar Lake.....	200	Morrow, Little Miami River, Todds Fork.....	300
Turkey Creek.....	100	Mount Healthy, Muth's pond.....	150
Whites Lake.....	51	Ripley, Eagle Creek.....	300
Newburg, Miffield Lake.....	100	Russells Point, Indian Lake.....	300
Norwood, Farm Pond.....	100	Lewistown Reservoir.....	300
Odessa, Lake Vinita.....	300		

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## CRAPPIE—Continued.

Disposition.	Finger- lings, yearlings, and adults.	Disposition.	Finger- lings, yearlings, and adults.
Oklahoma:		Oklahoma—Continued.	
Ada, Davis Lake.....	100	Woodward, Woodside Lake.....	100
Stewart Lake.....	100	Wrights Lake.....	100
Agra, Herrman's pond.....	100	Zahlen Lake.....	100
Apache, Beauty Lake.....	100	Pennsylvania:	
Arcadia, Sylva Hill Pond.....	100	Chester, Ridley River, Irvings Dam.....	200
Ardmore, Chickasaw Lake.....	200	Denver, Cocalico Creek.....	400
Hedges Lake.....	100	Frankstown, Juniata River, Franks- town Branch.....	300
Lake Meda.....	106	Huntingdon, Hydro Pond.....	200
Loyd's pond.....	200	Jonestown, Big Swatara Creek.....	400
Buffington, Illinois River.....	500	Lebanon, Colebrook Lake.....	200
Illinois River, Barren Fork.....	500	Lake Conewago.....	200
Caddo, Hull's pond.....	100	Lights Lake.....	200
Cherokee, La Brue Lake.....	300	Miller Pond.....	400
Sucker Flat Lake.....	200	Storer Lake.....	200
Christie, Barren Fork Bayou.....	100	Water House Lake.....	200
Elgin, Shirk's pond.....	100	McClure, Middle Creek, Branch of.....	150
Foraker, Robert's pond.....	100	South Carolina:	
Guthrie, Beland Lake.....	300	Abbeville, Little River.....	500
Santa Fe Lake.....	400	Florence, Black Creek.....	900
Henryetta, Stone's pond.....	100	Gaffney, Turner's pond.....	100
Hugo, City Lake.....	200	Honea Path, Clamp's pond.....	100
Outing Club Lake.....	300	Leesville, Shealy's pond.....	100
Kuli Chito Club Lake.....	200	Montmorency, Moore's pond.....	100
McAlester, Heard's pond.....	100	Mount Croghan, Klondike Pond.....	100
Marlow, Johnson's pond.....	100	Piedmont, Brushy Creek.....	200
Mill Creek, Chilly Creek.....	100	Garrison Lake.....	200
Mooreland, Heinz Lake.....	100	Grove Creek.....	300
Murray Lake.....	100	Saluda River.....	400
Noble, Kirbie Pond.....	100	Wellford, Berry Pond.....	300
Lake Dunaway.....	100	South Dakota:	
Oklahoma Lake.....	100	Belle Fourche, Orman Lake.....	500
Prairie Lake.....	100	Burke, Schulze's pond.....	250
Orlando, Ella Pond.....	100	Tripp, Lake Andes.....	500
Prairie Pond.....	100	Winnier, Lake Westonka.....	750
Paoli, Ke No Pond.....	100	Tennessee:	
Lane's pond.....	100	Athens, Richeson Pond.....	100
Pauls Valley, Morgan Lake.....	100	Brownsville, Davis Pond.....	50
Thompson Lake.....	200	Chatanooga, Spring Creek.....	100
Perry, Barne's pond.....	100	Dyersburg, Fowler's pond.....	50
Sharon, Baptist Lake.....	100	Fordtown, Halls Clermont Pond.....	100
Healey Lake.....	100	Gallatin, Baber's pond.....	50
Lowe Lake.....	100	Hermitage, Hurt's pond.....	50
Trotter Lake.....	100	Jackson, Simmons Pond.....	50
Shawnee, Kirst Lake.....	200	Lebanon, Cedar Creek.....	50
Mud Lake.....	300	Coe's pond.....	50
Stillwater, Sunnyside Resort Pond.....	100	Manchester, Duck River.....	200
Supply, Irwin Lake.....	100	Little Duck River.....	150
Tangler, Big Spring Lake.....	100	Phillips's pond.....	50
Horseshoe Lake.....	100	Mason, Greenlee Pond.....	100
Laubach's pond.....	100	Hamblet's pond.....	100
Turkey Creek.....	100	Memphis, Lago Felice.....	90
Wolf Lake.....	100	Sink's pond.....	100
Valliant, Mossy Lake.....	100	Nunnally, Piney Creek.....	100
Viel, Spurlock Lake.....	200	Shelbyville, Flat Creek.....	100
Woodward, Blue Lake.....	100	Tate, Helton Pond.....	200
Bowlby Lake.....	100	Texas:	
Circle Lake.....	100	Alma, Zerwer's pond.....	100
Clear Lake.....	100	Alvarado, Hallman Lake.....	100
Geismar Lake.....	100	Rogers Pond.....	75
Grant Lake.....	100	Amarillo, Palo Duro Creek.....	125
Hastings Lake.....	100	Arp, Willow Lake.....	100
Kline Lake.....	100	Athens, Koon Kreek Klub Lake.....	100
Kollar Lake.....	100	Atlanta, Johnson's pond.....	100
Kutchinski's pond.....	100	Richey's pond.....	100
Morrow Lake.....	100	Austin, Caldwell's pond.....	75
Peugh Lake.....	100	Sterrett Lake.....	150
Roundup Creek.....	100	Axtell, Morrow's pond.....	50
Santa Fe Lake.....	100	Bastrop, Country Club Lake.....	200
Smith Lake.....	100	Trige's lake.....	125
Spring Lake (A).....	100	Belleville, Pin Oak Lake.....	75
Spring Lake (B).....	100	Bluff Dale, Richardson Creek.....	100
Spring Lake (C).....	100	Bradshaw, Earnest Lake.....	75
Swartz Lake.....	100	Brady, Brady Creek.....	100
Turnbull Lake.....	100	Brownwood, Baugh's pond.....	125
Wegner Lake.....	100		

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## CRAPPIE—Continued.

Disposition.	Finger- lings, yearlings, and adults.	Disposition.	Finger- lings, yearlings, and adults.
Texas—Continued.		Texas—Continued.	
Brownwood, Halliman Pond .....	125	Llano, Llano River .....	200
Sunnyslope Pond .....	100	Oatman Creek .....	200
Caldwell, Caldwell Pond .....	125	Pecan Creek .....	200
Pollack's pond .....	100	San Fernando Creek .....	200
Wilson Lake .....	125	Lobo, Lobo Pond .....	75
Canadian, Witt's pond .....	200	Lockhart, Lake Sauchez .....	75
Childress, Richards's pond .....	100	Lometa, Santa Fe Lake .....	200
Chillicothe, Clark Lake .....	125	Longview, Lake Davernia .....	200
Cleburne, Country Club Lake .....	571	Longview Club Lake .....	200
Corsicana, Bunert Park Pond .....	50	Tate Lake .....	100
Burke Lake .....	100	Thrasher & Sessum Lake .....	200
David Place Pond .....	50	Maginta, Cheyenne Lake .....	125
Texas Company Pond .....	100	Marble Falls, Marble Falls Lake .....	200
Craft, Fish Lake .....	75	Marion, Schul's pond .....	75
Crockett, Collins's lake .....	100	Melissa, Echo Home Pond .....	75
Davy Crockett Lake .....	100	Memphis, Browder's pond .....	65
Lacy's lake .....	100	Mercury, Corn Creek .....	100
Le Gory's pond .....	100	Mexia, Cook's pond .....	75
Smith Pond .....	100	Mexia Lake .....	125
Crosbyton, White River .....	350	Petty's pond .....	75
Dallas, Burgher's pond .....	150	Mineola, Massengale's pond .....	75
Samuel's pond .....	150	Sand Springs Pond .....	100
Dawson, Akers's pond .....	50	Moody, Stampede Creek .....	125
Easley's pond .....	50	Mount Vernon, Arrington's pond .....	75
Klondike Pond .....	100	Dawson & Smith Pond .....	75
Del Rio, Charco Pond .....	100	Holbert's pond .....	75
Lake Dobbins .....	100	Narcissus, Clary's pond .....	75
Edna, Lavaca River .....	200	Navasota, Oakleigh Pond .....	100
Platonia, Arlm's pond .....	75	Yarborough Lake .....	150
Fort Worth, Dunmavin pond .....	200	New Braunfels, Comal River .....	300
Lake Edwin .....	150	O'Donnell, Randal's pond .....	75
Lake Worth .....	425	Paducah, Fry's pond .....	100
Gause, Deen's pond .....	100	Richards's pond .....	100
Georgetown, Berry Creek .....	375	Palestine, Cannon's pond .....	100
San Gabriel River .....	225	Phillips Lake .....	200
San Gabriel River, Middle Fork .....	150	Ross Lake .....	200
Gilmer, Jones's lake .....	100	Saline Lake .....	200
Grand Prairie, Willow Lake .....	75	Spring Lake .....	200
Grandview, Country Club Lake .....	545	Spring Park Lake .....	100
Walker's lake .....	50	Taylor's pond .....	100
Grapeland, Bobbitt Lake .....	100	Palo, Reagan's pond .....	325
Holcomb Lake .....	100	Placid, Turnell's pond .....	100
Greenbrier, Greenbrier Lake .....	100	Plano, Huffman's pond .....	100
Merrill's lake .....	100	Queen City, Shelton Pond .....	100
Greenville, Haney's pond .....	100	Rice, Fitzgerald's pond .....	100
Jones Club Pond .....	75	Riesel, Little Sandy Pond .....	75
King's pond .....	75	Local Stock Pond .....	75
Hampton, Fleming's pond .....	100	Rockwall, Nadine Pond .....	75
Henderson, Dunklin's pond .....	100	Rusk, Meadow Lake .....	50
Hillsboro, Electric Lake .....	150	San Angelo, Allen's pond .....	100
Ellington Lake .....	150	Grines's pond .....	125
Hillsboro Lake .....	150	Johnson's pond .....	100
Houston, Werner's pond .....	100	Sherwood's pond .....	75
Hubbard, Club Lake .....	50	Tweedy Lake .....	125
Davidson's pond .....	100	San Antonio, Willow Lake .....	475
Jones's pond (A) .....	100	San Marcos, Bachman Lake .....	300
Jones's pond .....	75	Blue Hole Pond .....	300
McDaniel's pond .....	100	Seeliger's pond .....	125
Matson & McDaniel Ponds .....	200	San Saba, Cherokee Creek .....	100
West Pond .....	100	Seguin, Cottonwood Creek .....	100
Hutchins, Dowdy Lake .....	125	Gerdes's pond .....	75
Jacksonville, Boles Lake .....	200	Geronimo Creek .....	200
Churchill Lake .....	100	Stephenville, Bosque River .....	200
Crysp Lake .....	200	Frey's pond .....	100
Dublin Lake .....	100	Moore's pond .....	100
Morris Club Lake .....	200	Terrell, Highpoint Pond .....	125
Justiceburg, Connell's pond .....	100	Oakwood Pond .....	100
Kerens, Price's pond .....	50	Walton Pond .....	75
La Porte, Cartier's pond .....	75	Thorndale, Beard's pond .....	100
Laredo, Bruni Pond .....	125	Smith's pond .....	100
Leander, Brushy Creek .....	200	Tyler, Cove Lake .....	100
Lindale, Club Lake .....	150	Spring Lake .....	150
Thompson Lake .....	150	Uvalde, Eight Mile Pond .....	100
Llano, Flag Creek .....	125	Turkey Creek .....	100
Johnson Creek .....	200	Valentine, Evan's pond .....	75

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## CRAPPIE—Continued.

Disposition.	Finger- lings, yearlings, and adults.	Disposition.	Finger- lings, yearlings, and adults.
Texas—Continued.		West Virginia—Continued.	
Vernon, Bates Lake.....	200	Shelton, Elk River.....	300
Bomer Pond.....	50	Wisconsin:	
Cobbs Lake.....	100	Birchwood, Balsam Lake.....	300
Mays Lake.....	60	Bass Lake.....	150
Reed's pond.....	100	Berry Lake.....	150
Rowland's pond.....	100	Birch Lake.....	150
Waco, Escondido Lake.....	75	Nice Lake.....	150
Gayland Farm Pond.....	75	Number One Lake.....	150
Waxahachie, Ellis Club Lake.....	150	Number Two Lake.....	300
Winfield, Smith's pond.....	75	Red Cedar Lake.....	150
Wortham, Longbotham's pond.....	100	Saw Mill Lake.....	300
Virginia:		Smith Lake.....	150
Butterworth, Butterworth Pond.....	150	Spider Lake.....	150
Carson, Hogwood Mill Pond.....	300	Blair, Trempealeau Pond.....	300
Charlottesville, Charlottesville Pond.....	450	Brokaw, Wisconsin River.....	400
Dispatch, Higgins Pond.....	300	Centuria, Rice Lake.....	200
Faber, Urban's pond.....	150	Sand Lake.....	300
Lee Hall, Lee Lake.....	300	Chippewa Falls, Glen Loch Lake.....	200
Lester Manor, Lanesville Pond.....	150	La Crosse, Dark Slough Creek.....	500
Mattoax, Highpoint Pond.....	150	Mississippi River.....	a 134,000
Norge, Seimimore Pond.....	150	Rice Lake.....	500
Pemberton, Johnson & Duncan Pond.....	300	Manitowish, Manitowish Lake.....	1,000
Petersburg, Brander Pond.....	150	Merrill, Long Lake.....	400
Winfree Pond.....	300	Seven Island Lake.....	400
Richmond, Cottrell's pond.....	300	North Freedom, Mirror Lake.....	1,200
Falling Creek Pond.....	450	Pine River Station, Pine River.....	400
Hickory Hill Pond.....	300	Richfield, Friess Lake.....	300
Suffolk, Copeland Lake.....	300	Lake Amy Belle.....	300
Cramer's pond.....	300	Richland, Partrey Mill Pond.....	200
Summit, Frazer's pond.....	300	Sheboygan Falls, Sheboygan River.....	1,000
Westham, Boulware's pond.....	300	Turtle Lake, Hillman Lake.....	150
Bowe's pond.....	150	Little Round Lake.....	150
Gregory's pond.....	150	Silver Lake.....	185
Westham Creek.....	150	Staples Lake.....	300
Westham Lake.....	150	Vesper, Maple River Pond.....	400
Wytheville, Reed Creek, South Fork.....	6,600	Wausau, Lake Wausau.....	800
West Virginia:		Wyoming:	
Cameron, Fish Creek.....	400	Cheyenne, Sloans Lake.....	100
Fairmont, Booth Creek.....	400	Glenrock, McDonald Pond.....	250
Prickett Creek.....	400		
White Day Creek.....	400	Total <sup>b</sup> .....	3,122,332

<sup>a</sup> Rescued from overflowed lands and restored to original waters.<sup>b</sup> Lost in transit, 970 fingerlings.

## ROCK BASS.

Disposition.	Finger- lings.	Disposition.	Finger- lings.
Arkansas:		Indiana:	
Alma, Bushmiser Pond.....	2,400	Atlanta, Garhart's pond.....	300
Batesville, Mobley Pond (A).....	1,000	Danville, Trotter's pond.....	100
Mobley Pond (B).....	1,000	Depauw, Blue River.....	250
Clarksville, Briscoe's pond.....	3,200	Dillsboro, Sanatorium Pond.....	100
Johnson, Avalon Pond.....	4,000	Donaldson, Koontz Lake.....	600
Pocahontas, Black River.....	184	Elkhart, Christiansa Creek.....	300
Colorado: Mancos, Weston's pond.....	200	Elkhart River.....	800
Florida: Wauchula, Breshy Creek.....	600	English, Dumlpin Creek.....	200
Georgia:		Little Blue River.....	400
Dalton, Mill Creek.....	500	Little Patoka Creek.....	200
Yeager's pond.....	200	Evansville, Watershed Pond.....	150
McDonough, Walnut Creek.....	500	Lexington, Englishton Park Pond.....	100
Summit, Johnson Pond.....	300	Lynn, Johnson's pond.....	100
Suwanee, Spence's pond.....	400	Marengo, Whiskey Run Creek.....	400
Illinois:		Munice, No Name Creek.....	300
Anna, Sitter's lake.....	200	Newburg, Sargent's lake.....	150
Belleville, Lake Christine.....	500	Otisco, Fourteen Mile Creek.....	300
Efingham, Greuel's pond.....	200	Radley, Duck Pond.....	200
Naperville, Du Page River.....	800	Saline City, Valleyview Pond.....	100
West Stone Quarry Pond.....	800	Scottsburg, Iola Lake.....	200

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## ROCK BASS—Continued.

Disposition.	Finger- lings.	Disposition.	Finger- lings.
<b>Indiana—Continued.</b>		<b>Missouri—Continued.</b>	
Sellersburg, Brock's pond.....	100	Rolla, Little Dry Fork Creek.....	2,000
Spades, Lake Flow Mah.....	100	Meramec River, Big Dry Fork.....	2,000
Sunman, Clear Pond.....	100	Saginaw, Walker Lakes.....	300
Wabash, Mississinnewa River.....	500	<b>New Jersey:</b>	
<b>Iowa:</b>		Asbury Park, Wesley Lake.....	200
Davenport, Lower Pond.....	150	Magnolia, Kinsey's pond.....	200
Yorktown, Miller's pond.....	125	Red Bank, Nanuet Pond.....	200
<b>Kentucky:</b>		<b>New York:</b>	
Bardstown, McClure's pond.....	100	Congers, New Lake.....	127
Buechel, Hikes Pond.....	150	Derby, Lily Pond.....	128
Cadiz, Birds Creek.....	300	Newburgh, Orange Lake.....	45
Caney Creek.....	300	Pine Plains, Stissing Lake.....	400
Donaldson Creek.....	300	<b>North Carolina:</b>	
Dyers Creek.....	200	Asheville, White Flint Pond.....	100
Little River, Lower.....	400	Drexel, Asbury's pond.....	150
Little River, Muddy Fork.....	300	Ela, Ocona Lufly River.....	400
Little River, Sinking Fork.....	200	Ellerbe, Mountain Creek.....	450
Little River, Upper.....	400	Etowah, Smith's pond.....	200
Campbellsville, Campbell's pond.....	200	Gold Hill, Poole's pond.....	150
Campbellsburg, Sunshine Lake.....	300	Greensboro, Print Works Lower Pond.....	200
Corbin, Chesnut's pond.....	400	Haw River, Lake Elizabeth.....	200
Covington, Dickman's pond.....	100	High Point, Yadkin River.....	400
Crab Orchard, Cedar Creek.....	300	Hillsboro, Bellevue Pond.....	400
Dix River.....	1,000	Hominy, Davis's pond.....	100
Crecent Springs, Reinhart's pond.....	150	Kings Mountain, Wells's pond.....	150
Elizabethtown, Boyd's pond.....	500	Lexington, Nokomis Lake.....	400
Irwin's pond.....	100	Louisburg, Gordon's pond.....	150
Eminence, Silver Lake.....	200	Morrisville, Kelly's pond.....	100
Thomas Pond.....	100	Oxford, Haymount Pond.....	150
Glasgow, Beaver Creek.....	600	Pee Dee, Blewitt Falls Pond.....	300
Boyd's Creek.....	300	Pinehurst, McDonald's pond.....	100
Miller's pond.....	100	Raleigh, Beaverdam Creek.....	400
Hazard, Kentucky River, North Fork.....	500	Roaring River, Briar Creek.....	400
Henderson, Sugar Tree Grove Pond.....	200	Caudill's pond.....	100
Woods Pond.....	400	Ronda, Brooks's pond.....	100
Isley, Ashmore's pond.....	100	Warren Plains, Weaver's pond.....	400
Fox's pond.....	100	Woodleaf, Third Creek Pond.....	200
Lebanon, McElroy's pond.....	200	<b>North Dakota: Leith, Kolbank Pond.....</b>	
London, McKee Pond.....	200	<b>Ohio:</b>	
Louisville, Lansdowne Lake.....	400	Archbold, Buehrer's pond.....	100
Millersburg, Hinkston Creek.....	500	Belleville, Wade's pond.....	200
Mortons Gap, Lovan's pond.....	200	Cincinnati, Chapman Lake.....	100
Mount Sterling, Prewitt's pond.....	100	Lake View, Indian Lake.....	500
Myra, Bumgardner's pond.....	200	Mansfield, Clearfork Creek, Buckhorn Branch.....	200
Nolin, Wolf Spring Pond.....	100	Clearfork Creek, Johnsville Branch.....	300
Nortonville, Oates's pond.....	100	<b>Oklahoma:</b>	
Paris, Hinxton Creek.....	400	Aydelotte, Willow Lake.....	7,500
Quicksand, Back's pond.....	100	Durant, Gunter's lake.....	1,000
Rowletts, Lester's pond.....	100	Guthrie, Joh's pond.....	4,500
Woodland Pond.....	200	McComb, Motley's pond (A).....	3,000
St. Charles, Coal Company Lake.....	300	Motley's pond (B).....	3,000
Springfield, Clement's pond.....	100	Motley's pond (C).....	4,500
Cooper's pond.....	500	Mill Creek, Five Mile Creek.....	5,000
Grundy Home Lake.....	500	Hepsey Creek.....	2,000
Roanoke Lake.....	500	Three Mile Creek.....	4,000
Stanford, Dix River, Hanging Fork.....	400	Pauls Valley, Derydyn's pond.....	3,000
Trenton, West Fork Creek.....	1,000	Perry, Reservoir Lake.....	3,000
Tyrone, Cedar Brook Pond.....	200	Shawnee, Kranning's pond.....	3,000
White Villa, North Lake.....	200	Tishomingo, Blue River.....	4,000
Williamsburg, Cumberland River.....	400	Mill Creek.....	4,000
Williamstown, Kendall Pond.....	200	Tribbey, Henderson's pond.....	3,000
Yeager, Shelby Creek.....	400	Vinita, Thompson's pond.....	2,000
<b>Louisiana: Dubach, Sconyer's pond.....</b>		<b>Pennsylvania:</b>	
<b>Maryland:</b>		Ellwood City, Crystal Pond.....	400
Asbestos, Burklee Pond.....	100	Hanover, Bechtel's pond.....	200
Charlestown, Seneca Pond.....	100	Jenkintown, Madieara's pond.....	200
Cheltenham, Brookfield Lake.....	200	Johnstown, Peters's pond.....	200
Woodbine, Warfield's pond.....	100	Quemahoning Lake.....	70
<b>Michigan:</b>		Sugar Run Dam.....	140
Twin Lake, West Lake.....	325	Lake Carey, Lake Carey.....	100
White Cloud, Little Robinson Lake.....	325	McClure, Middle Creek, West Branch.....	100
<b>Minnesota: Homer, Mississippi River.....</b>		Mocanagua, Priest Farm Pond.....	100
<b>Missouri:</b>		Oil City, McCall's pond.....	200
Butler, Spring Pond.....	150	Reading, Hill Creek.....	250
Crane, Lancaster Lake.....	300	Scranton, Lake William.....	100
Miller, Willow Spring Pond.....	65	Thurlow, Trainer Creek.....	300
Monett, Lake Mendon.....	100	Waterford, Lake Pleasant.....	600
Morrisville, Paris Pond.....	2,000	Wernersville, Glen Tilt Pond.....	250
Pleasant Hill, Lake Leonard.....	2,000		

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## ROCK BASS—Continued.

Disposition.	Finger- lings.	Disposition.	Finger- lings.
South Carolina:		Texas—Continued.	
Abbeville, Calvert's pond.....	100	Karnes City, Morris's pond.....	50
Central, Rowland's pond.....	150	Kaufman, Nash's pond.....	65
Easley, Jones's pond.....	200	Pasture Pond.....	50
Looper's pond.....	200	Kemp, Clear Lake.....	120
Robinson's pond.....	150	Long Lake.....	195
Honea Path, Clinkscales's pond.....	200	Trinity Lake.....	75
Poston, Johnson's pond.....	300	Laredo, Moritz Lake.....	100
Rock Hill, Davis Springs Pond.....	200	Lone Oak, Simmons's pond.....	50
Wellford, Middle Tiger Lake.....	100	Long Branch, Lake Claytonia.....	75
South Dakota: Smithwick, Happy Hol- low Pond.....	200	Lott, Greener's pond.....	75
Tennessee:		McKinney, Davis's pond.....	50
Baxter, Oliver's pond.....	150	Madisonville, Dean's pond.....	200
Brunswick, Kelly's pond.....	4,800	Marion, Sylvan Pond.....	50
Sink's pond.....	2,400	Mart, Reuwer's pond.....	100
Chattanooga, Lookout Ponds.....	400	Melissa, Nicholson's pond.....	50
Gates, Wilkes's pond.....	2,400	Middle Water, Todd's pond.....	100
Henry, Maple Lake.....	4,800	Midland, King's pond.....	50
Lexington, McHaney's pond.....	4,800	Midlothian, Gulf Lake.....	150
Medon, McDaniel Lake.....	4,800	Williams's pond.....	50
Oakdale, Emory River.....	200	Millsap, Millsap Lake.....	50
Powder Springs, Flat Creek.....	200	Minard, Ellis Reservoir.....	50
Riceville, Boyd's pond.....	100	Moscow, Holland's pond.....	50
Cagle's pond.....	100	Navarro, White Pond.....	50
Sparta, Officer's pond.....	200	Navasota, Floyd's pond.....	100
Tate Springs, German Creek.....	100	Nevada, Crenshaw's pond.....	50
Tellico Plains, Tellico Lake.....	400	New Boston, Hart's pond.....	100
Wartrace, Duck River, Garrison Fork.....	200	New Boston Club Pond.....	200
Texas:		Pirkey's pond.....	200
Arlington, Rudd Lake.....	100	Newville, Wall's pond.....	100
Asherton, Brown's pond.....	60	Pampa, Coffee's pond.....	100
Leonard's pond.....	60	Perry, Dyck's pond.....	50
Taylor's pond.....	60	Pine Hill, Orr's pond.....	75
Austin, Howell's pond.....	150	Pittsburg, Bermuda Lake.....	100
Big Wells, Wait's pond.....	50	Cottle Lake.....	100
Bonham, Bishop Lake.....	200	Plainview, Buena Vista Lake.....	200
City Lake.....	200	Duensing's pond.....	100
Bremond, Shaw's pond.....	100	Rosebud, Waters's pond.....	60
Brownwood, Roberts Lake.....	150	Richardson, Sunnybrook Pond.....	50
Taylor Lake.....	200	Riviera, Roberts's pond.....	75
Bryan, Oak Grove Pond.....	50	Rotan, Bacot's pond.....	50
Calvert, Jones's pond.....	75	Gyp Lake.....	50
Chester, Hampton Pond.....	75	Rugby, Day's pond.....	100
Cisco, Lake Burnie.....	175	Grant's lake.....	100
Reich Lake.....	100	Griffin's pond.....	50
College Station, Kyle's pond.....	100	Sadler, Sycamore Park Pond.....	50
Como, Gamblin Lake.....	100	San Antonio, Harrigan's pond.....	80
Cooledge, Osborn's pond.....	50	Saur's pond.....	80
Crockett, Smith Wilson Lake.....	150	Schulenberg, Clear Water Lake.....	50
Cushing, Stevens Pond.....	50	Sealey, Burger Pond.....	150
Dalhart, Wynne's pond.....	150	Sherman, Burton's pond (A).....	200
Dallas, Kidd Spring Pond.....	200	Burton's pond (B).....	200
De Leon, Chambers Lake.....	100	Slayden, Kaye Pond.....	100
Del Rio, San Felipe Creek.....	200	Teague, Daniel's pond.....	50
Deport, Latham Pond.....	100	Terrell, Meadow Lake.....	100
Willow Pond.....	100	Terry, Derrough-Singleton Pond.....	75
Dublin, Dublin Daisy Pond.....	50	Valley Mills, Alfalfa Dale Pond.....	50
Eagle Lake, Smith's pond.....	75	Vernon, Spring Creek.....	150
Edgewood, Wolfe's pond.....	100	Spring Lake.....	150
Edna, Lavaca River.....	100	Spring Pond.....	150
Navidad River.....	100	Victoria, Antonoli's pond.....	50
Sandies Creek.....	100	Wellborn, Barron's pond.....	50
Ellinger, Knolle's pond.....	50	Willis, Smith's pond.....	150
Falfurrias, Agua Buena Pond.....	50	Willis Point, Freeland Lake.....	100
Power Company Pond.....	50	Lake Campbell.....	100
Forney, Sowell's pond.....	100	Lake Gallatin.....	100
Fort Worth, Lake Worth.....	200	Lake Harris.....	100
Live Oak Creek.....	200	Lake Henry.....	100
Gainesville, Spring Creek.....	150	Utah: Murray, Spring Pond.....	200
Goodnight, Spring Creek Lake.....	150	Virginia:	
Grand Saline, Clear Lake.....	100	Abilene, Millandale Pond.....	150
Hallettsville, Gerdes's pond.....	75	Arrington, National Pond.....	100
Henderson, Menefee's pond.....	75	Baskerville, Piney Pond.....	50
Henrietta, Edwards's pond.....	100	Burnleys, Alta Vista Pond.....	150
Honey Grove, Gambill's pond.....	100	Chatham, Hunt's pond.....	150
Howe, The L Lake.....	50	Covington, Jackson River.....	500
Joaquin, Blackmon's pond.....	75	Danville, Walters's pond.....	250
Jourdanton, Hagelstein's pond.....	50	Dry Fork, Taylor's pond.....	100



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## ROCK BASS—Continued.

Disposition.	Finger- lings.	Disposition.	Finger- lings.
Virginia—Continued.		Virginia—Continued.	
Emporia, Meherrin River.....	160	Stanley, Hawksbill Pond.....	200
Goode, Lawson's pond.....	200	Swoope, Middle River.....	500
Gordonsville, Wellersbacher's pond.....	150	Union Level, Johnson's pond.....	50
Gretna, White Thorn Pond.....	125	Winchester, Lake Frederick.....	200
Hatton, Stevens's pond.....	200		
Norfolk, Smith Lake.....	150	Total <sup>a</sup> .....	165,149
South Hill, Westview Pond.....	50		

## WARMOUTH BASS.

Florida: Pinetta, Elbow Lake.....	150	Texas—Continued.	
Georgia: Roberta, Lowe's pond.....	100	Henderson, Lakewood Pond.....	75
Texas:		McDavid Lake.....	75
Henderson, Arnold Lake.....	75		
Burk Channel Pond.....	75	Total.....	700
Gary's pond.....	75		
Lake Charleybrook.....	75		

<sup>a</sup> Lost in transit, 250.

## SMALLMOUTH BLACK BASS.

Disposition.	Fry.	Finger- lings.	Disposition.	Fry.	Finger- lings.
Alabama:			Indiana—Continued.		
Bangor, Sugar Creek.....	5,000		Brazil, McGregor's pond.....		75
Birmingham, Village Creek			Columbus, Clifty Creek.....		150
Lake.....	12,500		White River, East Fork.....	7,500	
Creola, Hatter's lake.....	7,500		Depauw, Blue River.....		225
Fort Payne, Wills Creek.....	7,500		Dunkirk, Fishback's pond.....		50
Huntsville, Spring Pond.....		140	Dupont, Guthrie's lake.....		100
Leesburg, Terrapin Creek.....	10,000		Fort Wayne, Maumee River.....		100
Montgomery, Crescent Lake.....	5,000		St. Joseph River.....		150
Mosteller, Spring Creek.....	5,000		St. Marys River.....		100
Tuscumbia, Town Creek.....	12,500		Howe, Pigeon River.....	2,000	
Connecticut:			Pigeon Lake.....		300
Amston, Warner's pond.....	3,000		Huntington, Little River.....		150
Bristol, Cedar Lake.....		60	Salamonie River.....		200
Waterbury, Chestnut Hill			Wabash River.....		150
Pond.....		60	Indianapolis, Buck Creek.....	7,500	150
City Mills Pond.....		60	Eagle Creek.....	10,000	200
Lake Quassapaug.....		85	Fall Creek.....		150
Delaware:			White River.....	5,000	150
Wilmington, Circle Pond.....		100	Lagrange, Cline Lake.....	2,000	
Spring Pond.....		265	Mongo Mill Pond.....	4,000	
Georgia:			Shipshewana Lake.....	4,000	
Adairsville, Oothcalooga			Marion, Mississinnewa		
Creek.....	5,000		River.....		200
Atlanta, Brookhaven Lake.....	7,500		Michigan City, Clear Lake.....	2,000	
Cartersville, Euharlee Creek.....	10,000		Saguney Lake.....	2,000	
Wildwood, Lake Lookout.....	7,500		Tee Lake.....		150
Illinois:			Monticello, Tippecanoe		
Antioch, Hunter Lake.....	7,500		River.....	10,000	
Barstow, Rock River.....	10,000		Morristown, Blue River.....		200
Danville, Little Vermilion			Motts, Big Indian Creek.....	4,000	
River.....	10,000		New Albany, Mount St.		
Vermilion River, Middle			Francis Pond.....		50
Fork.....	7,500		Noblesville, Cicero Creek.....		150
Vermilion River, Salt			Hinkles Creek.....		150
Fork.....	7,500		Stony Creek.....		150
Grayslake, Third Lake.....	10,000		White River.....		200
Lake Zurich, Lake Zurich.....	7,500		North Vernon, Mascattauck		
Red Bud, Dinan's pond.....	7,500		Creek.....		150
Wilmington, Kankakee			Otisco, Fourteen Mile Creek.....		150
River.....	7,500		Peru, Eel River.....		225
Indiana:			Richmond, Thistlewait		
Bloomfield, Plummer Creek.....		150	Ponds.....	6,000	
Richland Creek.....		150	Spencer, Eel River.....	4,000	
Bluffton, Studebaker's pond.....		100			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## SMALLMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Finger- lings.	Disposition.	Fry.	Finger- lings.
<b>Kentucky:</b>			<b>Michigan—Continued.</b>		
Bowling Green, Drakes Creek.....		350	Clyde, Duck Lake.....	2,000	75
Brush Creek, Round Stone Creek.....	7,500		Irving Lake.....		200
Corbin, Lynn Camp Creek.....	7,500		Long Lake.....		100
Crab Orchard, Cedar Creek.....	5,000	300	Millford Lake.....		200
Danville, Caldwell Lake.....	12,500		Spring Lake.....		
Elizabethtown, Nolin River.....	2,500		Westerley Lake.....	1,000	400
Elkton, Dill Pond.....	7,500		Crystal Falls, Fortune Lake.....		400
Elk Fork Creek.....			Lake Marie.....		400
Frankfort, Cedar Creek and tributaries.....	7,500		Upper Holmes Lake.....		300
State Hatchery Pond.....	7,500		Davisburg, Pennell Lake.....	2,000	
Glasgow, Beaver Creek.....	10,000		Delaware, Beaver Lake.....		200
Herndon, Little River.....	10,000		Bete Gris Bayou.....		200
Hodgenville, Lily Pond.....		1,000	Deer Lake.....		200
Jackson, Kentucky River, North Fork.....	10,000		Lac La Belle.....		200
Maceo, Kingfisher Lake.....	5,000		Lake Upson.....		200
Nortonville, No. 1 Lake.....	7,500		Mud Lake.....		300
Paris, Xalapa Lakes.....	3,000		Dunham, Lake Celeste.....		
Shelbyville, Brashears Creek.....	10,000		Edmore, Little Penny Lake.....	2,000	
Somerset, Fishing Creek.....		600	Edwardsburg, Davis Lake.....	1,000	
Pittman Creek.....		600	Elba, Riley Lake.....	2,000	
Stamping Ground, North Elkhorn Creek.....	10,000		Escanaba, Ontonagon Lake.....		400
Stearns, Kinne's pond.....	5,000		Farwell, Deadmans Lake.....	1,000	
Rock Creek.....		600	Devils Lake.....	1,000	
<b>Louisiana:</b> Lake Charles, Cal- casieu River.....	4,000		Dollar Lake.....	1,000	
<b>Maine:</b> Fryeburg, Lake Keyar.....		198	Lower Lake.....	1,000	
<b>Maryland:</b>			Snod Lake.....	1,000	
Detour, Double Pipe Creek.....		106	Thirteen Lake.....	1,000	
Monocacy River.....		193	Francisco, Clear Lake.....	1,000	
Dorsey, Deep Run Branch.....		53	Gaylord, Crescent Lake.....	2,000	
<b>Massachusetts:</b>			Greenville, Bass Lake.....	2,000	
Lowell, Burgess Pond.....	800		Fish Lake.....	2,000	
Nabnasset Pond.....	800		Loon Lake.....	4,000	
Newfield Pond.....	800		Sanderson Lake.....	2,000	
Sagamore, Wakeby Lake.....		200	Turk Lake.....	4,000	
Shelburne Falls, Ashfield Pond.....		50	Turkey Lake.....	4,000	
Bardwell Pond.....		50	Hastings, Barber Lake.....		400
Franklin Pond.....		50	Bumps Lake.....		400
Gardner Falls Lake.....		50	Carters Lake.....		400
Griswold Pond.....		50	Leach Lake.....		300
Lamson-Goodnow Pond.....		50	Long Lake.....		400
Mannings Eddy Pond.....		50	Highland, Dunham Lake.....	2,000	
Reservoir No. 2.....		50	Long Lake.....	2,000	
Reservoir No. 3.....		50	Pettibone Lake.....	2,000	
Reservoir No. 4.....		50	Round Lake.....	2,000	
Shattuck Pond.....		50	Waterbury Pond.....		50
Willis Place Pond.....		50	Whalen Lake.....	2,000	
<b>Michigan:</b>			Holly, Allen Lake.....	1,000	
Alpena, Franks Lake.....	1,000		Bevins Lake.....	1,000	
Grand Lake.....	2,000		Long Lake.....	2,000	
Hubbard Lake.....	2,000		Mallett Lake.....	1,000	
Amasa, Fire Lake.....		300	School Lot Lake.....	1,000	
Lake Lady.....		400	Warren Lake.....	1,000	
Au Train, Au Train Lake.....		400	Wendell Lake.....	1,000	
Belding, Pine Island Lake.....	4,000		Houghton, Otter Lake.....		400
Belleville, "Q" Pond.....	2,000		Interlochen, Duck Lake.....		300
Bergland, Lake Gogebic.....		500	Green Lake.....		300
Calumet, Medora Lake.....		300	Iron Mountain, Bass Lake.....		300
Caro, Cass River.....	8,000		Ishpeming, Flat Lake.....		300
Cassopolis, Stone Lake.....	1,000	200	Gribben Lake.....		300
Cedar City, Andresen's pond.....	2,000		Silver Lake.....		300
Champion, Lake Michi- gamme.....		500	Jackson, Big Portage Lake.....	2,000	
Charlevoix, Adams Lake.....		150	Brown Lake.....	1,000	
Matchett Lake.....	2,000		Portage Lakes.....		225
Nowland Lake.....	2,000	150	Finton Lake.....	1,000	
Susan Lake.....		200	Vandercook Lake.....	2,000	
Twenty Six Lake.....	2,000	200	Jones, Driskel Lake.....	1,000	
West Twin Lake.....	2,000		Kenton, Crystal Lake.....		300
Cliff, North American River.....		200	Maggie Walton Lake.....		150
			Ontonagon River, East Branch.....		200
			Kingsley, Arbutus Lake.....	2,000	
			Lake Ann, Bellows Lake.....	1,000	
			Lake View.....	1,000	
			Ransom Lake.....	1,000	
			Lake Gerald, Lake Gerald.....		300
			Lake Gogebic, Merrowether River.....		100

## Details of distribution of fish and eggs, fiscal year 1916—Continued.

## SMALLMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Finger- lings.	Disposition.	Fry.	Finger- lings.
Michigan—Continued.			Michigan—Continued.		
Lakeland, Huron River.....	4,000	-----	Saline, Spring Lake.....	1,000	-----
Strawberry Lake.....	4,000	-----	Sidnaw, Burns Lake.....		100
Little Lake, Horseshoe Lake.....		300	Chapin Lake.....		100
Little Lake.....		400	Corbin Lake.....		100
Spring Lake.....		300	Crystal Lake.....		100
Mandan, Copper Creek.....		200	Kunze Lake.....		100
Hoar Lake.....		200	McClelland Lake.....		50
Lake Addie.....		200	Murphy Lake.....		100
Lake Fanny Hooe.....		200	Reed Lake.....		100
Lake Patty.....		200	South Range, Lake Eva.....		300
Manganese Lake.....		200	Stager, Stager Lake.....		300
Medora River.....		100	Sturgis, Adams Lake.....	2,000	-----
Partridge Lake.....		200	Twin Lakes, Johnson Lake.....		300
Marenisco, Hawk Lake.....		300	Lake Gerald.....		400
Heart Lake.....		300	Warren, Brick Yard Pond.....	2,000	-----
Lake Gogebic.....		625	Waterford, Williams Lake.....		150
Marquette, Badger Creek Pond.....		200	Watersmeet, Allen Lake.....		300
Lake Thirty Two.....		300	Lost Lake.....		300
Star Lake.....		300	Wetmore, Mirror Lake.....		500
Michigamme, Gibson Lake.....		300	Reddies Lake.....		500
Millersburg, Barnhardt Lake.....	2,000	-----	White Cloud, Crystal Lake.....		300
Mullet Lake, Mullet Lake.....		500	Little Paterson Lake.....		300
Negaunee, Hanson Lake.....		300	Lost Lake.....		300
Horseshoe Lake.....		300	Witbeck, Chief Lake.....		300
Newaygo, Emerald Lake.....		200	Outlet Lake.....		300
Sylvan Lake.....		200	Witch Lake.....		300
Niles, Barron Lake.....	4,000	200	Wixom, Moores Lake.....	1,000	-----
Northville, Cooley Lake.....	15,000	-----	Wooster, Peck Lake.....		300
Long Lake.....	12,500	-----	Missouri:		
Silver Lake.....		200	Aurora, Big Flat Creek.....	680	-----
Straits Lake.....	12,500	-----	Marceline, Santa Fe Club Lake.....		216
Union Lake.....	17,500	-----	St. Joseph, Crowley Lake.....		500
Walled Lake.....	17,500	-----	Savanna, Club Preserve Lake.....		480
Oden, Crooked Lake.....	4,000	-----	Verona, Spring River.....	850	-----
Onato, Deer Lake.....		300	Mississippi: Corinth, Powells Pond.....	2,500	-----
Orchard Lake, Cooley Lake.....	2,000	-----	New Jersey:		
Cranberry Lake.....	4,000	-----	Branchville, Culver Lake.....		212
Long Lake.....	2,000	-----	Bridgeville, Mountain Lake.....		106
Oscoda, Cook Site Pond.....	2,000	-----	Camden, Willow Grove Lake.....		159
Van Ettan Lake.....	2,000	-----	Hackettstown, Guard Lock Lake.....		106
Otia, Benton Lake.....	2,000	-----	Musconetong Pond.....		212
Lake Otia.....		400	State fish commission.....		159
Owosso, Shiawassee River.....		225	Hammononton, Hammononton Lake.....		159
Peacock, Sable Lake.....		300	Paterson, Pompton Lake.....		265
Penroga, Indian Lake.....		400	Trenton, Gropp's lake.....		53
Phoenix, Gratiot Lake.....		400	Silver Lake.....		106
Thayers Lake.....		200	New York:		
Tobacco River.....		200	Batavia, Horseshoe Lake.....		159
Pori, Bab Lake.....		300	Bridgehampton, Kellis Lake.....		145
Quimby, Clear Lake.....		300	Central Bridge, Schoharie River.....		300
Cox Lake.....		300	Clemons, Pine Lake.....		195
East Lake.....		300	Clinton Corners, Upton Lake.....		150
Long Lake.....		300	Cobleskill, Schuyler Lake.....		150
Middle Lake (A).....		300	Smith Lake.....		200
Middle Lake (B).....		300	Summit Lake.....		150
Mixer Lake.....		300	Colliers, Goodyear Lake.....		200
Podunk Lake.....		300	Congers, New Lake.....		100
Republic, Michigamme River.....		400	De Ruyter, Tioughueoga Lake.....		106
Rose Center, Arnold Lake.....	1,000	-----	Irvington on Hudson, Ir- vington Lake.....		150
Bates Lake.....	1,000	-----	Johnstown, East Caroga Lake.....		150
Bennett Lake.....	1,000	-----	Lake Clear Junction, Os- good Lake.....		141
Buckhorn Lake.....	3,000	-----	Lake Mahopac, Wickson Pond.....		150
Cheese Lake.....	1,000	-----	Monroe, Walton Lake.....		350
Downing Lake.....	2,000	-----	Monticello, Kiamasha Lake.....		100
Field Lake.....	1,000	-----	Newburgh, Orange Lake.....		150
Garden Lake.....	1,000	-----	Niagara Falls, Niagara River.....		159
Gardner Lake.....	1,000	-----	Parish, Little Salmon River.....		106
Green Lake.....	2,000	-----			
Humiston Lake.....	1,000	-----			
Longton Lake.....	1,000	-----			
Mud Lake.....	1,000	-----			
Munger Lake.....	1,000	-----			
Perrigo Lake.....	1,000	-----			
Small School Lot Lake.....	1,000	-----			
South Buckhorn Lake.....	1,000	-----			
Trumpet Lake.....	1,000	-----			

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## SMALLMOUTH BLACK BASS—Continued.

Disposition.	Fry.	Finger- lings.	Disposition.	Fry.	Finger- lings.
New York—Continued.			Pennsylvania—Continued.		
Peekskill, Johnston's pond.....		125	Horrell, Juniata River.....		
Petersburgh, Lake Tilley.....		100	Frankstown Branch.....		159
Pine Bush, Paugheaughaughsinque Creek.....		100	Huntingdon, Juniata River.....		159
Riparius, Brant Lake.....		130	Juniata River, Raytown Branch.....		159
Ronkonkoma, Lake Ronkonkoma.....		200	Indian Creek, Indian Creek.....		106
St. Johnsville, East Canada Lake.....		150	Johnstown, Quemahoning Lake.....		106
Green Lake.....		150	Sugar Run Pond.....		106
Lily Lake.....		50	Lititz, Cocalico Creek, Lower.....		106
West Canada Lake.....		50	McClure, Jacks Creek.....		106
Schroon Lake, Schroon Lake.....		65	Manheim, Chicoquis Creek.....		106
Syracuse, Cross Lake.....		50	Phillipsburg, Delaware River.....		159
Jamesville Reservoir.....		50	Royersford, French Creek.....		106
Lake Owahgena.....		50	Kimberton Pond.....		53
Skaneateles Lake.....		50	Schuykill River.....		53
Ulster Park, Mirror Lake.....		100	Selins Grove, Penns Creek.....		106
Water Mill, Lake Nowedonah.....		195	Sewickley, Big Travis Creek.....		106
Wayland, Loom Lake.....		200	Williamsport, Pine Creek.....		159
White Plains, Rye Lake.....		450	York, Conewago Creek.....		106
North Carolina: Asheville, Club Lake.....		250	Tennessee: Tullahoma, East Mulberry Creek.....		300
Lake Fernhurst.....		350	Vermont:		
Ohio:			Danville, Keeser Pond.....		195
Batavia, Little Miami River, East Fork.....		1, 150	Mud Pond.....		195
Stone Lick Creek.....		150	Fairlee, Lake Morey.....		150
Columbus, Alum Creek.....		200	Ferrisburg, Little Otter Creek.....		95
Black Lick Creek.....		200	Hardwick, Valley Lake.....		50
Duncan Run.....		333	Morrisville, Lake Lamoille.....		195
Licking River.....		234	North Ferrisburg, Cedar Lake.....		195
Olentangy River.....		233	Poultney, Lake St. Catherine.....		195
Raccoon Creek.....		200	Rocky Point, Groton Pond.....		200
Rocky Fork Creek.....		200	Rutland, Meadow Lake.....		75
Defiance, Maumee River.....		150	Otter Creek.....		75
Georgetown, White Oak Creek.....		150	Springfield, Black River.....		100
Lawsha, Ohio Brush Creek.....		150	Swanton, Lake Champlain.....		40
Lima, McCullough Lake.....	2, 000		Winooski, Winooski River.....		195
Loveland, Little Miami River.....		150	Virginia:		
Morrow, Little Miami River.....		300	Edinburg, Shenandoah River, North Fork.....	6, 000	
Little Miami River, Todds Fork.....		300	Lee, Powhatan Club Pond.....	7, 500	
Newark, Licking River.....	6, 000		Marion, Holston River, Middle Fork.....	3, 500	
Raccoon Creek.....	2, 000		Richmond, Allen Club Lake.....	3, 000	
Rocky Fork Creek.....	2, 000		Forest Hill Lake.....	3, 000	
Ripley, Eagle Creek.....		150	Roanoke, Roanoke River.....	7, 500	450
Troy, Great Miami River.....	4, 000		Salem, Roanoke River.....		450
Lost Creek.....	2, 000		Stephens City, Opequon Creek.....	6, 000	
Urbana, Brush Lake.....		150	Taylorville, Little River.....	3, 000	
Nettle Creek.....		100	Woodstock, Shenandoah River, North Fork.....	6, 000	
Washington Court House, Compton Creek.....	2, 000		Wytheville, Cove Creek.....		300
Paint Creek.....	2, 000		West Virginia:		
Paint Creek, North Fork.....	2, 000		Bluestone Jct., Bluestone River.....	10, 000	
Winchester, White Oak Creek.....		2, 000	Elkins, Tygarts Valley River.....	12, 000	
Woodfield, Sunfish Creek.....	2, 000		Elm Grove, Wheeling Creek.....	15, 000	
Oklahoma: Wainwright, City Pond.....		780	Huntington, Guyandotte River.....	10, 000	
Pennsylvania:			Keyser, Patterson Creek.....	10, 000	
Dalmatia, Susquehanna River.....		159	Marlinton, Kapps Creek.....	8, 000	
Fairview, Wigton Ponds.....		159	Wellsburg, Buffalo Creek.....	10, 000	
Gettysburg, Big Marsh Creek.....		106	Romney, South Branch River.....	5, 000	
Greenville, Little Shenango River.....		53	Total a.....	762, 710	65, 169
Harrisburg, Conodoguinet Creek.....		159			

a Lost in transit, 159 fingerlings and 35,000 fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
Alabama:		Alabama—Continued.	
Abbeville, Abbey Creek.....	100	Gantt, Gantt Mill Pond.....	1,000
Arnold Pond.....	100	Rawl Mill Creek.....	150
Choctawhatchee River.....	3,250	Wayne Able Pond.....	200
Espey's pond.....	150	Greenville, Four Mile Mill Pond.....	200
Ward Lake.....	100	Guntersville, Smith's mill pond.....	2,000
Alexander City, Hillabee Creek.....	300	Haleyville, Clear Creek.....	600
Tankersley's pond.....	100	Headland, Brown's mill pond.....	50
Alpine, Caldwell Pond.....	150	Helena, Buck Creek.....	3,500
Alton, Dean's lake.....	2,000	Inverness, Hill Pond.....	100
Andalusia, Riley's pond.....	150	Irvington, Clear Lake.....	1,000
Anniston, Choccolocco Creek.....	4,000	Jacksonville, Brown's pond.....	200
Mangham's pond.....	2,000	Jamestown, Mill Creek.....	80
Oxford Lake.....	300	Leighton, Town Creek.....	1,000
Rock Creek.....	100	Lincoln, Choccolocco Creek.....	300
Whiteside's pond.....	4,000	Hollingsworth's pond.....	100
Willett's pond.....	60	Lisman, Miller's pond.....	1,000
Ashby, Myrtle Lake.....	200	Wahaloe Creek.....	2,000
Athens, Mackey's pond.....	1,500	Livingston, Ziegler's pond.....	300
Bangor, Beechwood Lake.....	500	Luverne, Kings Lake.....	750
Birmingham, Edgewood Lake.....	1,000	McDonald Lake.....	250
Turkey Creek.....	1,000	Matthews Lake.....	250
Boaz, Moss Pond.....	1,000	Welch's pond.....	250
Brantley, Hill's pond.....	150	Madison, Bronaugh's pond.....	500
Tuck's pond.....	750	Fletcher's pond.....	500
Brent, McMillan's pond.....	750	Jamar Pond.....	2,000
Brewton, Barbour's pond.....	500	Willow Lake.....	2,000
Big Jumper Creek.....	500	Montgomery, Gravel Pit Lake.....	1,250
Cedar Creek Pond.....	500	Holt's lake.....	750
Ellis Pond.....	1,000	Irvine Lake.....	750
Murder Creek.....	500	Naftel, Naftel Pond.....	750
Brierfield, Mahans Creek.....	4,000	Newton, Jones's pond.....	100
Brundidge, Dubose's pond.....	500	Oneonta, Little Warrior River.....	2,000
Caleis, Kelly Creek.....	1,500	Opp, Weaver's pond.....	80
Caldwell, Forman's mill pond.....	60	Ozark, Weeks's pond.....	500
Camden, Albritton's pond.....	30	Paint Rock, Paint Rock River.....	1,080
Capps, Fall Pond.....	250	Pelham, White's pond.....	1,000
Carney, Carney Pond.....	110	Pike Road, Crow Nest Lake.....	400
Cedar Bluff, Johnson's pond.....	1,000	Quinton, Skelton Creek.....	1,300
Chase, Flint River.....	500	Reads Mill, Reads Mill Pond.....	200
Cherokee, Keeton's pond.....	30	Rendalia, Riser's pond.....	100
Chesterfield, Lookout Mountain Lake.....	30	Repton, Porter's pond.....	1,000
Clanton, Foshee's pond.....	500	Russellville, Sloss Pond.....	300
Clayton, Clarks Old Mill Pond.....	150	Rutherford, Cowiker Creek.....	1,500
Clayton's pond.....	100	Samson, Crew's pond.....	50
Kennedy's pond.....	250	Selma, Ivey Pond.....	100
Martin's pond.....	100	Kahn's pond.....	200
Old Warren Pond.....	300	Melwood Lake.....	200
Cobra, Lake Bologna.....	50	Speigner, State Farm Pond.....	1,000
Courtland, Big Nance Creek.....	1,000	Sterrett, Kelly Creek.....	300
Cuba, McGowen's pond.....	600	Stewart, Hedleston Lake.....	600
Dancy, Baker's pond.....	50	Suilligent, Brush Creek Pond.....	1,000
Cedar Lake.....	1,000	Talladega, Pope Creek.....	50
Virginia Lake.....	1,000	Tallassee, Tallapoosa River.....	200
DeArmanville, Choccolocco Creek.....	300	Three Notch, Bluff Creek.....	200
Demopolis, Prout's lake.....	500	Johnston's pond.....	100
Warrior River.....	200	Lake View.....	300
Dora, Big Warrior River.....	900	Thornton's pond (A).....	100
Elba, Allred's lake.....	200	Thornton's pond (B).....	100
Backwater Lake.....	300	Thornton's pond (C).....	100
Elmore, Goree's pond.....	50	Troy, Henderson's lake.....	1,000
Ethelsville, Hancock's pond.....	1,000	Tuscaloosa, Johnston's pond.....	300
Eufaula, Country Club Pond.....	1,250	Union Springs, Edward's pond (A).....	500
Evergreen, Cane Brake Creek.....	500	Edward's pond (B).....	500
Fayetteville, Averitt Branch.....	50	Rosenstihl's pond.....	150
Florala, Lake Jackson.....	2,800	Sims's pond.....	500
Foley, Lake Petit.....	1,000	Uniontown, Beeker Pond.....	1,000
Walker's lake.....	1,000	Perry Place Pond.....	500
Ft. Payne, Little River.....	4,000	Stollenwerch Pond.....	2,000
Town Creek.....	4,000	Valley Head, Benges Creek.....	30
Gadsden, Bellevue Pond.....	1,600	Verbena, Chestnut Creek.....	750
Cox Lake.....	2,000	Wells, Price's pond.....	50
Noculula Creek.....	3,000	Whatley, Grant Lake.....	250

<sup>a</sup> Fry indicated by an asterisk (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
<b>Arizona:</b>		<b>Florida:</b>	
Ash Fork, Lewis's pond.....	200	Alturas, Star Lake.....	750
Meath Pond.....	200	Bartow, Polk Lake.....	300
Piachao Pond.....	200	Chapman, Pearl Lake.....	750
Clarkdale, Pecks Lake.....	300	Clermont, Lake Oakley.....	750
Naco, Naco Pond.....	100	Compass Lake, Compass Lake.....	400
Prescott, Lake Watson.....	900	Crescent City, Lake Stella.....	130
San Simon, Buck's pond.....	100	Davenport, Lake Edward.....	500
Williams, Howard Lake.....	300	De Funiak Springs, Buffalo Lake.....	750
<b>Arkansas:</b>		Chipley Lake.....	750
Cable Creek, Big Piney Creek.....	* 4,000	Lake Stanley.....	750
Camden, Bradley Lake.....	155	De Land, Blue Lake.....	1,000
Johnson Lake.....	150	Wood's pond.....	250
Webb Lake.....	225	East Lake, Lake Weir.....	1,850
Woodard Lake.....	80	Eustis, Eustis Lake.....	1,000
Elba, Little Red River.....	{ 4,000	Lake Joana.....	750
Elkins, White River.....	{ 2,000	Lake Saunders.....	1,000
Greenland, White River, East Fork.....	800	Lake Yale.....	1,000
Hope, Coffey Lake.....	* 2,000	Flora, Heart Lake.....	1,500
Kings River, Kings River.....	400	Fort Meade, Four Mile Lake.....	300
Osage River.....	300	Fort Myers, Aloha Creek.....	100
Little Rock, Dickinson Lake.....	2,000	Geneva, Buck Lake.....	3,700
Neimer Lakes.....	2,000	Lake Leota.....	300
Spring Lake.....	2,000	Grand Ridge, Lake Alford.....	100
Mammoth Spring, Spring River.....	{ * 25,000	Lakeland, Lake Bonnett.....	750
Ozark, Mulberry Creek.....	105	Lake Bonney.....	750
Patmos, Burns Mill Pond.....	120	Lake Hollingsworth.....	750
Willow Spring Pond.....	* 3,000	Lake Hunter.....	750
Pocahontas, Black River.....	* 6,000	Lake Morton.....	750
Lewis's lake.....	204	Lake Parker.....	750
Mansco Creek.....	75	Magnolia Glen Pond.....	2,100
Mill Creek.....	50	Laurel Hill, Gordon's pond.....	250
Russellville, Illinois Bayou, East Fork.....	25	Leesburg, Lake Griffin.....	1,250
South Greenfield, Cox's pond.....	* 3,000	Mohawk, Mohawk Lake.....	1,000
Springdale, Dan Lewis Lake.....	300	Monticello, Lake Catherine.....	200
East Brush Creek.....	400	Loch Mary Ellen.....	200
Illinois River.....	400	Rocky Ford Branch.....	400
Osage River.....	800	Wolf Pond.....	200
Richland Creek.....	600	Ocala, Vetter's pond.....	100
Spring Creek.....	600	Orlando, Kuhl Lake.....	300
War Eagle Creek.....	600	Lake Hardeman.....	70
White River.....	400	Lake Jenne Jewell.....	750
Swan Lake, Swan Lake.....	400	Sebring, Horse Lake.....	1,750
Texarkana, Country Club Lake.....	* 3,000	Sorrento, Lake Kittie.....	750
<b>Colorado:</b>		Tarpon Springs, Lake Butler.....	800
Akron, Gill's lake.....	600	Wauchula, Brushy Creek.....	750
Avondale, Grant's pond.....	300	Carter Lake.....	1,250
Falcon, Edwards's pond.....	150	Hog Branch.....	500
Glenwood Springs, Lyle Lake.....	300	Horse Creek.....	1,000
Grand Junction, Redlands Pond.....	600	Little Charley Creek.....	1,500
Hooper, King's lake.....	300	Peace Creek.....	300
Lamar, Adobe Lake.....	750	Pin Crow Lake.....	2,500
Chain of Lakes.....	750	Red Water Lake.....	2,500
Two Buttes Lake.....	750	Sand Branch.....	200
Loveland, Benson Lakes.....	300	Thompson Creek.....	950
Fairport Lake.....	450	Troublesome Creek.....	750
Rist-Benson Lake.....	450	Turkey Creek.....	200
Manzanola, Mallett's lake.....	300	Whittington's pond.....	200
Miramonte, Carter's lake.....	300	Winter Haven, Boat Course Lake.....	400
Peyton, Herman Pond.....	300	Eagle Lake.....	1,000
Rouse Junction, Valdez Lake.....	450	<b>Georgia:</b>	
<b>Connecticut:</b>		Atlanta, Glen Iris Creek.....	4,000
East Windsor, Windsorville Pond.....	100	Augusta, Anderson Mill Pond.....	750
Niantic, Cedar Lake.....	200	Hagler Pond.....	2,000
Patagansett Lake.....	200	Hancock Pond.....	2,000
West Cornwall, Cornwall Pond.....	200	Keys Mill Pond.....	2,000
<b>Delaware:</b>		Lombard Pond.....	3,000
Cheswold, Sherwood Mill Pond.....	125	Spirit Creek.....	3,000
Felton, Felton Club Ponds.....	375	Wright's pond.....	2,000
Laurel, State Game Farm Pond.....	375	Austell, Noses Creek.....	1,000
Wilmington, Circle Pond.....	125	Sweetwater Creek.....	6,000
		Avera, Chalker's pond.....	500
		Bainbridge, Alford's pond.....	500

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, a finger- lings, yearlings, and adults.	Disposition.	Fry, a finger- lings, yearlings, and adults.
Georgia—Continued.		Georgia—Continued.	
Bainbridge, Sikes Mill Pond.....	750	Oglethorpe, Flint River.....	400
Barretts, Ocean Wave Pond.....	750	Whitewater Creek.....	750
Bellville, Overstreet's pond.....	500	Omega, Gay's pond.....	250
Riggs's pond.....	500	Palmetto, Springdale Lake.....	2,500
Berner, Ocmulgee River.....	5,000	Quitman, Silver Lake.....	500
Bowdon, Beck Mill Creek.....	3,000	Withlacoochee River.....	750
Little Tallapoosa River.....	4,000	Reidsville, McCall's pond.....	500
Bowman, Beaverdam Creek.....	3,000	Rochelle, Holt's pond.....	750
Braswell, Lake Jacall.....	1,000	Senoia, Keg Creek.....	3,000
Bronwood, Kinchafoonee Creek.....	750	Sharpe Spur, Darby Garbut Pond.....	250
Calhoun, Dew's pond.....	200	Smyrna, Anthony's pond.....	1,000
Carrollton, Buck Creek.....	3,000	Social Circle, Almond's pond.....	1,000
Centralhatchee Creek.....	2,000	Crawley's pond.....	2,000
Tallapoosa River.....	4,000	Duval Lake.....	2,000
Cleveland, Tesnatee Creek.....	3,000	McDowell's pond.....	1,000
Town Creek.....	4,000	Williams's pond.....	1,000
Coffee, Smith's mill pond.....	500	Stevens Pottery, Echols Pond.....	2,000
Columbus, Ram Pond.....	3,000	Summerville, Clemmons Pond.....	100
Comer, Edwards Mill Pond.....	4,000	Gamble Creek.....	100
Noell's pond.....	4,000	Sylvania, Freeman Pond.....	750
Covington, Covington Mill Pond.....	4,000	Temple, Tallapoosa River.....	1,500
Culverton, McWhorter's pond.....	2,000	Thomasville, Blue Pond.....	500
Cuthbert, Butler's mill pond.....	500	Tioga, Call Creek.....	100
Daisy, Tippins's pond.....	500	Tyrone, Adams's pond.....	1,000
Dalton, Whitfield Club Lake.....	4,000	Union Point, English's pond.....	1,500
Willow Dale Lake.....	1,000	Valdosta, Indian Pond.....	500
Davisboro, Tarver's mill pond.....	2,000	Whitewater Club Lake.....	1,000
Deercourt, Walters Pond.....	2,000	Washington, Fishing Creek.....	5,500
Douglas, McClelland Pond.....	500	Little River.....	5,000
Douglassville, Austell's pond.....	500	Watkinsville, Durham's pond.....	100
Elberton, Beaverdam Pond.....	7,000	Oconee River.....	7,000
Ellijay, Cartecay River.....	1,250	Waynesboro, Beaverdam Creek.....	500
Ellijay River.....	200	Beaverdam Pond.....	500
Fairburn, Favers Pond.....	2,000	Buckhead Creek.....	1,000
Fairfax, Satilla River.....	400	White Plains, Sanders Pond.....	2,000
Farmington, Marshall's pond.....	250	Williamsburg, Natcheaway Creek.....	1,250
Fayetteville, Lake Bennett.....	3,000	Wray, Harper's pond.....	500
Gainesville, Brennan Lake.....	300	Luke's pond.....	500
Chattahoochee River.....	2,000	Illinois:	
Little River.....	2,000	Belvidere, Kishwaukee River.....	50
Gay, Wyche's pond.....	100	Carrollton, Walnut Hall Lake.....	300
Gillsville, Candler's Creek.....	1,000	Coulterville, Creamery Pond.....	40
Grove River Lake.....	100	Park Pond.....	40
Suddath's pond.....	100	Danville, Vermillion River.....	240
Gough, Buckhead Lake.....	300	Vermillion River, North Fork.....	200
Greensboro, Bowden's pond.....	2,000	Franklin, Burlington Lake.....	200
McCommons's pond.....	3,000	Hamilton, Montebello Bay.....	250
Hawkinsville, Big Creek.....	4,000	Hillsboro, Hope's pond.....	40
Hephzibah, Grindstone Pond.....	200	Service Lake.....	80
Murphey's pond.....	750	Seymour North Lake.....	80
Holly Springs, Little River.....	2,500	Seymour South Lake.....	120
Jefferson, Shield's pond.....	100	Hudgens Station, Crystal Springs Lake.....	240
Jonesboro, Jester's old mill pond.....	2,000	Jacksonville, Morgan Lake.....	250
Lakemont, Lake Stevenson.....	1,250	Lena, Mammoosier Lake.....	200
Rabun Lake.....	8,000	McLeansboro, Burnett's pond.....	80
Lavonia, Tugaloo River.....	200	Mascoutah, Lincoln Lake.....	80
Lithonia, Whitley's pond.....	2,000	Mercedosa, Illinois River.....	b 28,940
Lyons, Page's pond.....	150	Mercedosa Bay.....	b 40
McDonald, Satilla River.....	300	Napierville, Du Page River.....	450
McIntyre, Jackson's pond.....	100	North Stone Quarry Pond.....	525
Macon, Nelson Mill Pond.....	750	Nashville, Carlsbad Lake.....	120
Willow Lake.....	1,000	Polo, Pine Creek.....	150
Winship Pond.....	500	Prentice, Hodgson Park Pond.....	100
Milledgeville, Cox's pond.....	1,000	Rockford, Rock River.....	720
Millhaven, Brier Creek.....	1,000	Warren, Apple River.....	800
Monroe, Apalachee River.....	350	West Point, Spence's pond.....	250
Montezuma, Harrison's pond.....	500	Indiana:	
Morven, Morrison's pond.....	500	Anderson, Anade Pond.....	100
Nelson, Artauw's pond (A).....	100	Batesville, Hillcrest Golf Club Lake.....	100
Arthur's pond (B).....	100	Bethany Park, Jewel Lake.....	300
Nichols, Grandon Lake.....	250	Birdseye, Blume's pond.....	100
North Helen, Hiawasse River.....	300	Bloomington, Bean Blossom Creek.....	400

a Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

b Rescued from overflowed lands and restored to original waters.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
Indiana—Continued.		Iowa—Continued.	
Bloomfield, Dones Creek.....	200	Clear Lake, Clear Lake.....	400
Inman Creek.....	200	Corydon, Poston's pond.....	100
Booneville, Sunlight Pond.....	200	Cresco, Turkey River.....	400
Woodland Lake.....	100	Davenport, Vanderveer Park Lake.....	300
Cedar Lake, Cedar Lake.....	375	Decorah, Upper Iowa River.....	300
Chili, Eel River.....	375	Earlville, Plum Creek.....	150
Columbus, Big Sand Creek.....	300	Eldora, Iowa River.....	250*
Corydon, Fleace's pond.....	100	Emmetsburg, Medium Lake.....	400
Kirkham's pond.....	100	Lime Springs, Forrester Mill Pond.....	400
Crawfordsville, Rock River.....	300	Upper Iowa River.....	1,000
Crown Point, Fancher Lake.....	500	Mason City, Lime Creek.....	300
Culver, Lake Maxinkuckee.....	300	North McGregor, Mississippi River.....	b 5,300
Dale, Bockstahler's pond.....	100	Oelwein, Lake Oelwein.....	400
De Long, Tippecanoe River.....	375	Osceola, Rarick's pond.....	115
Donaldson, Koontz Lake.....	375	Seymour, City Reservoir.....	200
Dubois, Patoka River.....	300	Steamboat Rock, Iowa River.....	250
Eckerty, Railroad Pond.....	100	Kansas:	
English, Blue River.....	300	Cherryvale, City Lake.....	300
Little Blue River, Bogard Fork.....	200	Clifton, Randle's pond.....	100
Little Blue River, Otter Fork.....	200	Fredonia, Rainbow Lake.....	150
Patoka River.....	300	Girard, Burnett's lake.....	200
Evansville, Wiltshire's lake.....	100	McFarland Lake.....	200
Flat Rock, Flat Rock River.....	300	Huron, Anthony Farm Pond.....	300
Frankfort, Shoemaker Lake.....	125	Junction City, Country Club Lake.....	500
Germany, Tippecanoe River.....	250	Kincaid, Grindstone Lake.....	200
Greencastle, Big Walnut Creek.....	300	La Cygnes, Middle Creek.....	250
Griffin, Fish Pond.....	100	Lebo, Cassell's pond.....	100
Huntingburg, Woods Valley Pond.....	100	Lyndon, Salt Creek.....	300
Hymera, Consolidated Mine Pond.....	100	Moran, Moran Lake.....	500
Warren Coal Company Pond.....	200	Mound City, Little Sugar Creek.....	300
Indianapolis, Eagle Creek.....	150	Olathe, Cedar Creek Lake.....	300
Fall Creek.....	250	North Lake.....	200
White River.....	225	South Lake.....	150
Kendallville, Bixler Lake.....	300	Paola, Bull Creek.....	300
Little Long Lake.....	300	Marais des Cygnes River.....	200
Kingsbury, Manja Mill Pond.....	200	Wea Creek.....	300
Knightstown, Furgeson Lake.....	100	Peabody, Spring Creek.....	200
Lake Cicott, Lake Cicott.....	300	Pittsburg, Rodells Pond.....	400
Leiters Ford, Tippecanoe River.....	375	Richmond, Richmond Pond.....	500
Lynn, Greenville Creek.....	100	St. Francis, Case's pond.....	150
Marysville, Fourteen Mile Creek.....	200	Spring Creek.....	300
Milltown, Big Blue River.....	300	Selden, Prairie Dog Creek.....	600
Morgantown, Bowman's pond.....	100	Stanley, Rural Retreat Lake.....	400
Muncie, Mississinnewa River.....	300	Kentucky:	
White River.....	400	Allensville, Gill's pond.....	250
Otisco, Fourteen Mile Creek.....	200	Prince's pond.....	250
Richmond, Hawkins Lake.....	200	Barbourville, Fighting Creek.....	40
Morton Lake.....	100	Mountain Lake.....	600
Richmond Lake.....	300	Bardstown, Beam's lake.....	400
Whitewater River.....	200	Bloomfield, Chaplin River.....	60
Whitewater River, East Fork.....	100	Boston, Lick Creek.....	40
Whitewater River, Middle Fork.....	100	Wilson Creek.....	40
Ridgeville, Lake Pequanahaw.....	250	Bowling Green, Sloss's pond.....	*2,000
Roann, Lukens Lake.....	375	Brandenburg, George Long Pond.....	70
Russellville, Rock Lake.....	100	Hunter's pond.....	70
Scottsburg, Waunita Pond.....	100	Campbellsville, Big Pittman Creek.....	60
Shelbyville, Drakes Lake.....	100	Campbellsville Lake.....	60
Summitville, McLain's pond.....	100	Utilities Lake.....	800
Roseboom's pond.....	100	Carlisle, Carlisle Pond.....	70
Sunman, Big Four Pond.....	100	Cave City, North Valley Lake.....	*2,000
Terre Haute, Evergreen Lawn Pond.....	100	Cornettsville, Kentucky River, North Fork.....	860
Pierson's pond.....	100	Crab Orchard, Hutching Pond.....	80
Tippecanoe, Tippecanoe River.....	375	Springs Hotel Lake.....	400
Twelve Mile, Hilda Lake.....	100	Crestwood, Cox's pond.....	100
Veederburg, Coal Creek.....	300	Crofton, Railroad Lake.....	500
Vincennes, Frisz's lake.....	200	Cumberland Falls, Cumberland River.....	1,200
Lakewood Park Lake.....	300	Danville, Caldwell's lake (A).....	60
Waynetown, Coal Creek.....	300	Caldwell's lake (B).....	200
Iowa:		Duckers, Smith's pond.....	140
Allerton, Railroad Pond.....	200	East View, Nolin Creek.....	140
Anamosa, Buffalo River.....	300	Elizabethtown, Bunnell's pond.....	300
Bellevue, Mississippi River.....	b 30,600	Fife Ponds.....	125
Charlton, Williamson Lake.....	265		

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.<sup>b</sup> Rescued from overflowed lands and restored to original waters.



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
Kentucky—Continued.		Kentucky—Continued.	
Elizabethtown, Rough Creek.....	800	Morehead, Triplett Creek.....	40
West Rhudes Creek.....	400	Mount Sterling, Bogle's pond.....	150
Elkhorn City, Big Sandy River, Levisa Fork.....	225	Bruton Branch.....	70
Big Sandy River, Russells Fork.....	500	Johnson's pond.....	150
Escondida, Green Creek.....	70	Little State Creek.....	40
Franklin, Banton's pond.....	*2,000	Prewitt Pond.....	150
Comer's pond.....	200	Walker's pond.....	70
Gap in Knob, Cedar Creek.....	40	New Haven, Rolling Fork River.....	60
Georgetown, Elkhorn River.....	300	Newstead, Jenkin's pond.....	250
Hall's pond (A).....	70	Olive Hill, Kinniconick Creek.....	105
Hall's pond (B).....	35	Olmstead, Whipporwill Creek.....	*4,000
North Elkhorn River.....	40	Red Oaks, Twin Pond.....	250
Payne Pond.....	100	Richmond, Kensington Lake.....	200
Glasgow, Skeggs Creek.....	*4,000	Lake Reba.....	1,000
Strader's pond.....	125	Otter Creek.....	40
Glasgow Junction, Sunnyside Pond.....	125	Rowletts, Lester's pond.....	70
Glandale, Nolin Creek.....	375	Salt Lick, Licking River.....	140
Greenbrier, Lake Greenbrier.....	100	Salvisa, Salt River.....	60
Greenup, Little Sandy River.....	80	Samuels, Sherman Lake.....	20
Guthrie, Hibiscus Lake.....	500	Shelbyville, Brown's pond.....	100
Mimms's pond.....	500	Bullskin Creek.....	400
Harrodsburg, Chaplin River.....	60	Guthrie's pond.....	100
Hazard, Kentucky River, North Fork.....	60	South Park, South Park Lake.....	1,000
Hiseville, Hodges's pond.....	125	Springfield, Cartwright Creek.....	40
Summers's pond.....	125	Cottonwood Lake.....	400
Hodgenville, Creal's pond.....	300	Highview Lake.....	200
Heady's pond.....	300	Staunton, Red River, North Fork.....	140
Martin Pond.....	70	Stephensburg, Stephensburg Lake.....	70
Nolin River, South Fork.....	600	Stithton, Mill Creek.....	200
Slaughter's pond.....	70	Tip Top, Valley Lake.....	100
Sutton Pond.....	300	Tonleville, Shipp's pond.....	200
Weldon's pond.....	300	Trenton, West Fork Creek.....	1,000
Hopkinsville, Lake Tandy.....	1,000	Walton, Rankin's pond.....	70
Winfree's pond.....	500	West Point, Shady Grove Pond.....	200
Horse Cave, Higason's pond.....	*2,000	Whick, Kentucky River, North Fork.....	600
Hulen's pond.....	*2,000	Whitesburg, Kentucky River, North Fork.....	100
Hutchen's pond.....	*2,000	Williamsburg, Cumberland River.....	800
Love's pond.....	*4,000	Winchester, Crump's pond.....	70
Mustain's pond.....	*2,000	Woodburn, Station Pond.....	*2,000
Oldham's pond.....	*2,000	Louisiana:	
Poynter's pond.....	*2,000	Carencro, Lake Chillon.....	*1,000
Veluzat's pond.....	*4,000	Clinton, Brick Yard Lake.....	200
Young's pond.....	*4,000	Coushatta, Dupree's pond.....	3,000
Idamay, Sturgeon River.....	1,025	Hand's pond.....	1,500
Jackson, Kentucky River, North Fork.....	800	Duberly, Shadow's pond.....	*2,000
Jenkins, Elkhorn Lake.....	150	Keatchie, Derrick Lake.....	*1,000
Johnson, Fleming Creek.....	300	Fisher's lake.....	*1,000
Knob Lick, Blue Spring Creek.....	250	Hall's pond.....	*1,000
La Grange, Irwin's pond.....	70	Schuler's pond.....	*1,000
Latonia, Jockey Club Lake.....	80	Lake Charles, Wilson's pond.....	*3,000
Lebanon, Caney Creek.....	600	Lake Providence, Lake Providence.....	*8,000
Cloyds Creek.....	600	Nettie, Magnolia Lake.....	200
Graham's pond.....	40	New Orleans, Audubon Park Lake.....	400
Hardin Creek.....	600	Shreveport, Comegy's pond.....	*1,000
Indian Creek.....	600	Pruett Lake.....	*3,000
North Rolling Fork Creek.....	600	Tremont, Perrine's pond.....	27
Pine Hill Pond.....	300	Urania, Lake Urania.....	*9,000
Pope Creek.....	600	Whitman, Jackson's pond.....	1,500
Rolling Fork Creek.....	900	Zwolle, Mill Pond.....	200
South Rolling Fork Creek.....	600		*2,000
Lexington, Quarry Pond.....	150	Maryland:	
Louisville, Wagner's lake.....	200	Alberton, Patapsco Creek.....	75
Lyndon, Marcia Power House Lake.....	100	Alesia, Little Gunpowder River.....	300
Maceo, Kingfisher Lake.....	*20,000	Annapolis Junction, Little Patuxent River.....	750
Madisonville, Wilderness Pond.....	500	Antietam, Antietam Creek.....	300
Marshall, Licking Creek, North Fork.....	300	Baltimore, Gwynns Falls Lake.....	200
Middlesborough, Fern Lake.....	80	Bladensburg, Bellevue Pond.....	150
Little Yellow Creek.....	80	Forest Lake.....	200
Millersburg, Carpenter's pond.....	100	Boring, Piney Run.....	150
Hinkston Creek.....	400	Capitol Heights, Star Lake.....	200
Moberly, Lake Valentine.....	200	Catoctin, Potomac River.....	300
Morton, Lake Rabbit.....	1,000		

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
<b>Maryland—Continued.</b>		<b>Michigan—Continued.</b>	
Chestertown, Brice's mill pond.....	125	Ellsworth, Eaton Lake.....	200
Cockeysville, Black Rock Run.....	100	Noble Lake.....	200
Conowingo, Deer Creek.....	300	Whites Lake.....	200
Cropley, Potomac River.....	600	Gladwin, Chesser Lake.....	100
Cumberland, Evitts Creek.....	950	Round Lake.....	100
Flintstone Creek.....	200	Hardy, Crooked Lake.....	300
Potomac River.....	1,850	McPhee Lake.....	300
Town Creek.....	650	Sand Lake.....	300
Wills Creek.....	350	Hastings, Leach Lake.....	200
Easton, Peach Blossom Creek.....	125	Lower Lake.....	200
Ellerslie, Wills Creek.....	50	Middle Lake.....	100
Ellicott City, Little Patuxent River.....	200	Highland, Lake Dunham.....	170
Emmitsburg, Toms Creek.....	400	Houghton, Lake Gerald.....	200
Forestville, Belle Chance Lake.....	75	Lake Roland.....	200
Frederick, Linganore Creek.....	550	Twin Lakes.....	200
Monocacy River.....	1,650	Iron River, Camp Lake.....	200
Frostburg, Casselman River.....	1,200	Chicagoan Lake.....	200
Glencoe, Gunpowder River.....	250	Stanley Lake.....	200
Hagerstown, Antietam Creek.....	600	Jackson, Brown Lake.....	170
Conococheague Creek.....	900	Gillett Lake.....	170
Licking Creek.....	100	Vandercook Lake.....	170
Hughesville, Goode's pond.....	100	Wolf Lake.....	170
LeGore, Monocacy River.....	300	Kalamazoo, Gull Lake.....	300
Middletown, Catocin Creek.....	300	Lake Ann, Bellows Lake.....	300
Mount Calvert, Patuxent River.....	875	Lake Ann.....	400
North East, Big Northeast Creek.....	125	Lake Rosa.....	300
Rockville, Lakeview Farm Pond.....	100	Lake View.....	300
Smithsburg, Lake Villa Farm Lake.....	300	Lakeview, Bass Lake.....	100
Snow Hill, Pocomoke River.....	625	Lapeer, Lake Bronson.....	100
Taneytown, Bear Creek.....	600	Lake Nepessing.....	100
Woodbine, Cat Tail Creek.....	150	McKeen Lake.....	100
Woodmont, Potomac River.....	750	Mohawk, Duncans Bay.....	350
<b>Massachusetts:</b>		Niles, Colvin Lake.....	100
Annawan Lake, Annawan Lake.....	200	Singer Lake.....	100
Gloucester, Cape Pond.....	100	Smith Lake.....	150
Greenfield, Connecticut River.....	200	Omena, Omena Bay.....	400
Deerfield River, Upper.....	200	Orchard Lake, Spring Lake.....	300
Lee, Upper Goose Lake.....	400	Provemont, Lake Leelanau.....	800
New Bedford, Cedar Dell Pond.....	200	Ramonia, Diamond Lake.....	400
Little Quittacas Pond.....	200	Richland, Gull Lake.....	100
North Dartmouth Mill Pond.....	200	Long Lake.....	100
Pittsfield, Onota Lake.....	200	Miller Lake.....	100
Pontosuc Lake.....	200	Rose Center, Bush Lake.....	170
Shelburne Falls, Beaver Lake.....	100	Esler Lake.....	170
Springfield, Lake Congamond.....	300	Saginaw, Saginaw River.....	300
West Barnstable, Long Pond.....	100	Sidnaw, Gregory Lake.....	200
Lot Pond.....	100	Norway Lake.....	200
Mystic Lake.....	200	South Branch, Adams Pond.....	300
<b>Michigan:</b>		Iosgemaw Pond.....	200
Allenville, Brevort Lake.....	200	Turtle, Bear Lake.....	200
Alma, Pine River.....	150	Hemlock Lake.....	100
Alpena, Long Lake.....	600	Independence Lake.....	200
Baldwin, Lake Cashion.....	340	Island Lake.....	200
Belding, Big Wabasis Lake.....	150	Maple Lake.....	100
Beulah, Crystal Lake.....	800	Miller Lake.....	200
Buchanan, Clear Lake.....	150	Mosquito Lake.....	100
Pike Lake.....	150	North Lake.....	100
Charlevoix, Matchett Lake.....	400	Rat Lake.....	200
Clare, Arnold Lake.....	170	Silver Lake.....	200
Bailey Lake.....	340	Spruce Lake.....	200
Beebe Lake.....	170	Sutherland Lake.....	200
Dollar Lake.....	170	Twin Lake, Twin Lake.....	300
East Lake.....	170	Union City, Turtle Lake.....	170
Gerow Lake.....	170	Vincent Lake.....	340
Glass Lake.....	170	Yorkville, Gull Lake.....	100
Gut Lake.....	170	<b>Minnesota:</b>	
Loon Lake.....	170	Alexandria, Lake Henry.....	300
Round Lake.....	150	Lake Ida.....	300
South Lake.....	170	Lake Milona.....	300
Stevens Lake.....	170	Harmony, Iowa River.....	200
Clyde, Fish Lake.....	170	Homer, Mississippi River.....	{ *70,000 b 485
Dunham, Heart Lake.....	200	Lanesboro, Root River.....	
Edwardsburg, Davis Lake.....	150		200

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.<sup>b</sup> Rescued from overflowed lands and restored to original waters.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
Minnesota—Continued.		Mississippi—Continued.	
Lanesboro, Root River, North Branch	200	Pickens, Johnson Pond	45
Preston, Iowa River	100	Plantation, McCool's pond	*2,000
Root River	100	Pontotoc, Bishop's pond	150
Mississippi:		Pope's pond	500
Aberdeen, Jandon's pond	*4,000	Porterville, Rogers's pond	*1,000
Murf's pond	*4,000	Prairie, Lawler Pond	200
Amory, Hatley Lake	*4,000	Quincy, Jones Lake	1,000
Malone Lake	*6,000	Raworth, Raworth Pond	1,200
Booneville, Cape Horn Lake	*2,000	Rienzi, Monroe's pond	*4,000
Mason's pond	*2,000	Perry's pond	*4,000
Braxton, Willow Pond	18	Sandersville, Sellar's pond	600
Burdette, Dan Williams Lake	*5,000	Sarah, Poe's pond	400
Byram, Woodall Pond	500	Walnut Lake	700
Canton, Galoway Lake	1,000	Shuqualak, Fleming's pond	300
Horseshoe Lake	1,000	Silver Leaf Lake	600
Lutz's pond	1,000	Silver Water Pond	300
Round Lake	500	Starkville, Chesser's pond	200
Cleveland, Sunflower River	1,250	Richey's pond	*2,000
Clinton, Lewis's pond	200	Stringer, Stringer's pond	300
Columbia, Simmons's pond	300	Strongs, Clays Creek	*4,000
Corinth, Bynum Lake	225	Dream Lake	*4,000
Hinton Lake	100	Fuller Pond	*4,000
Miller's pond	225	Hanging Kettle Creek	*4,000
Waukomis Lake	*8,000	Taylorville, Ford's pond	1,000
White Lake	*4,000	Theadville, McRae's pond	150
Fernwood, Little Tangipahoa River	1,000	Thornton, Bee Lake	*2,000
Packwood Lake	1,000	Tupelo, Harman's pond	150
Flora, Bradley's pond	200	Ritter's pond	*4,000
Oakhurst Pond	200	Threlkeld's pond	500
Gloster, Bass Lake	30	Turnbull, Heart Lake	200
Bates Pond	200	Perkins's pond	200
Beresford's pond	60	Vicksburg, Long Lake	400
Fern Lake	60	Wahalak, Bealler Lake	200
Hoskins's pond	30	Persons's pond (A)	200
Potenga's pond	30	Persons's pond (B)	200
Robinson's pond (A)	200	Persons's pond (C)	200
Robinson's pond (B)	30	Vaughn Lake	200
Tarver Pond	200	Waynesboro, Barnett's pond	150
Gulfport, Bayou Bernard	*6,000	Sigler's pond	600
Guntown, Norton's pond	*4,000	Wethersby, Prime's Lake	200
Hazelhurst, Lake Hazle	500	Wesson, Emery Lake	350
Heidelberg, Thornton's pond	200	Winchester, Winchester Lake	56
Jackson, Carson's pond	500	Yazoo City, Williams's pond	*8,000
Ratliff Inland Pond	500		265
Kosciusko, Boyd-Laudrum Pond	*2,000	Missouri:	
Buck Spring Pond	*2,000	Amsterdam, Amsterdam Lake	600
Carpenter's pond	*2,000	Aurora, Little Flat Creek	300
Cooper's pond	*2,000	Branson, Lake Taneycomo	900
Cullen's pond	*2,000	Cabool, Brushy River	300
Currie's pond	*2,000	Hog Creek	200
Doss's pond	*2,000	Piney River	400
Evans's pond	*2,000	Cuba, Burbeuse River	300
Presley's pond	*2,000	Deepwater, Dickey Lake	200
Longview, Heflin's pond	*2,000	De Soto, Exposition Lake	300
Louisville, McCully's pond	60	Doniphan, Current River	400
Lumberton, Williamson's pond	200	Elk Springs, Elk River	450
McAdams, Gilbert's pond	200	Excelsior, Kimber Lake	200
Macon, Stemia Pond	*1,000	Firma, Barrett Lake	200
Madison, Jones Lake	*4,000	Fredericktown, St. Francis River	400
Magnolia, Crystal Lake	500	Gilliam, Slick Bottom Lake	150
Maridian, South Pond	*2,000	Higginsville, Chicago & Alton Pond	400
Mossville, Hogan's pond	1,000	Holmes Park, Excelsior Lake	400
Mount Olive, Amenson's pond	200	Independence, Compton's lake	140
Crafts Creek	1,500	Ironton, Lake Killarney	300
Natchez, Ormonde Pond	400	Kearney, Ludwig's lake	350
Noxapafer, Young's pond	1,000	Lebanon, Mayfield's pond	150
Ocean Springs, Simmon's pond	500	Lisle, Lisle Lake	1,300
Okolona, Abernathy's pond	*1,000	Louisiana, Salt River	625
Adams's pond	111	McBride, Saline Creek	200
Pachuta, Phaeti Lake	1,500	Macon, Bleas Lake	210
Pheba, Terry's pond	*6,000	Mansfield, Lake Crystal	400
Philadelphia, Lundy Lake	500	Martin City, Merryvale Lake	600
		Mexico, Burlington Lake	625

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
<b>Missouri—Continued.</b>		<b>New York—Continued.</b>	
Mine La Motte, Mine Creek Lake.....	105	Fishkill, Bennywater Pond.....	100
Newburg, Little Piney Creek.....	140	Brinckeroff Pond.....	100
Ozark, Finley River.....	450	Lake Garda.....	100
Palmyra, Bay de Charles.....	375	Kings Park, Loony Lake.....	250
Pierce City, City Lake.....	300	Lake Mahopac, Kirk Lake.....	200
Rolla, Little Piney Creek, Lower.....	105	Lyons, Ganargua Creek.....	300
Saginaw, Montgomery Lake.....	450	Machias, Lime Lake.....	400
Sloan's lake.....	450	Martindale, Forest Lake.....	300
St. Charles, Ballast Pit Lake.....	300	Millbrook, Sandanoma Lake.....	100
St. Clair, Burboise River.....	500	Oneonta, Susquehanna River, Collins	
Ste. Genevieve, Boslers Pond.....	200	Dam.....	300
Bovene's pond.....	100	Orangeburg, Maze's pond.....	125
Clark Lake.....	200	Parish, Grays Pond.....	250
Roettler Lake.....	100	Port Henry, Lake Champlain.....	625
St. Louis, Rock Lake.....	70	Riverside, Rogers Pond.....	250
St. Marys, Pouyer's pond.....	100	Schroon Lake.....	625
Savannah, Blakeslee Lake.....	300	Thurman Pond.....	250
South Greenfield, Cox's pond.....	100	Ronkonkoma, Lake Ronkonkoma.....	625
Van Vleet, Gum Tree Pond.....	60	Schenectady, Featherstone Lake.....	500
Montana: Huntley, Huntley Creek.....	100	Shinnecock Hills, Far Pond.....	500
Nebraska:		Wayland, Loon Lake.....	500
Paxton, Cedar Creek.....	100	<b>North Carolina:</b>	
Virginia, Virginia Lake.....	250	Angier, Rambaut's pond.....	*600
<b>New Hampshire:</b>		Apex, Johnson's pond.....	40
Amherst, Baboosic Lake.....	200	Pate's pond.....	20
Berlin, Head Pond.....	200	Silver Lake.....	20
Littleton, Forest Lake.....	200	Upchurch's pond.....	*600
Meredith, Lake Winnepesaukee.....	300	Asheville, Big Ivy Creek.....	40
Nashua, Corbett Pond.....	200	White Flint Pond.....	40
North Weare, Weare Reservoir.....	200	Auburn, Farrill's pond.....	*400
Pelham, Gumpus Pond.....	200	Benson, Parrish's pond.....	*600
Island Pond.....	300	Black Mountain, Otobrook Creek.....	1,500
<b>New Jersey:</b>		Brown Summit, Cunningham Mill	
Beaver Lake, Beaver Lake.....	500	Pond.....	*400
Blairstown, Fairview Lake.....	200	Burlington, Griffin's pond.....	400
Butler, Apsahwa Pond.....	200	Holman's mill pond.....	400
Camden, Malaga Lake.....	250	Calypso, Goshen Swamp Pond.....	60
Portstown Lake.....	250	Charlotte, Catawba River.....	120
Portstown River.....	250	Coats, Nordon's pond.....	*400
Gibbstown, Third Creek.....	125	Concord, Mill Pond.....	*400
Haddon Heights, Haddon Heights			200
Lake.....	125	Connelly Springs, Cannon Branch.....	200
Millville, Union Lake.....	250	Corapeake, Mathias's pond.....	*1,600
Mountain Lake, Mountain Lakes.....	200	Cranberry, Toe River.....	150
Wildwood Lake.....	200	Culberson, Mill Creek.....	1,000
Newton, Swartswood Lake.....	250	Dillard, Big Creek.....	120
Picatinney, Picatinney Lake.....	375	Dillsboro, Tuckasegee River.....	6,195
Red Bank, Lake Marion.....	125	Edenton, Queen Anns Creek.....	225
South Ogdensburg, Hawthorne Lake.....	200	Elizabethtown, Spring Branch.....	*400
<b>New Mexico:</b>		Elkin, Roaring River.....	40
Abbott, Abbott Reservoir.....	200	Falcon, King's pond.....	*400
Carlsbad, Black River.....	500	Fayetteville, Cedar Lake.....	*700
Cimarron, Antelope Valley Lakes.....	600	Cumberland Lake.....	40
Espanola, Hatch Pond.....	200	McNair Ponds.....	40
Kenna, Bonam Pond.....	200	Flat Rock, Lowndes's pond.....	20
Las Vegas, Hooker's pond.....	100	Garland, Peterson Pond.....	*500
Onava, La Jara Lake.....	150	Gastonia, Catawba Creek.....	*600
Lake David.....	100	Gold Hill, Campbell's pond.....	75
Raton, McAuliffe Lake.....	100	Second Creek.....	75
Roswell, North Bottomless Lakes.....	200	Goldston, Dunns Pond.....	*400
Shoemaker, Cherry Valley Lake.....	150	Sharps Pond.....	*400
Socorro, Rito Springs Pond.....	300	Greenlee, Greenlee Lake.....	40
Springer, Jaritas Lake.....	150	Greensboro, Hayworth's pond.....	*400
<b>New York:</b>		Hilton's pond (A).....	*400
Addison, Canisteo River.....	300	Hilton's pond (B).....	*600
Goodhue Lake.....	300	Stinking Quarter Pond.....	2,200
Bainbridge, Mud Pond.....	125	Guilford College, Horse Pen Pond.....	*400
Binghamton, Chenango River.....	200	Hamlet, Hatcher's mill pond.....	40
Silver Lake.....	300	Hendersonville, Club Lake.....	40
Susquehanna River.....	300	Jordan's pond.....	20
Clayton, St. Lawrence River.....	375	Lake Warzaw.....	40
Delanson, Upper Lake.....	300	Laurel Park Lakes.....	40

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
North Carolina—Continued.		North Dakota—Continued.	
Lily Pond.....	40	St. John, Gravel Lake.....	200
Twin Springs Lake.....	5,000	Jarvis Lake.....	200
Hickory, Baker's pond.....	200	Krooks Lake.....	200
Catawba River.....	1,400	Long Lake.....	200
Foard's pond.....	700	Mill Lake.....	200
High Point, Willis's pond.....	400	Oak Lake.....	200
Kingsboro, Nobles Mill Pond.....	40	Oslund Lake.....	200
Lumberton, McMillan's pond.....	*300	Purdy Lake.....	200
Marion, Catawba River, North Fork.....	40	Schnavilly Lake.....	200
Gilkey's pond.....	40	Taylor Lake.....	200
Loftis Pond.....	2,500	Walker Lake.....	200
Morgan's lake.....	2,500	Wimbleton, Spiritwood Lake.....	300
North Fork Creek.....	2,500	Ohio:	
Patton Mill Pond.....	2,500	Akron, Long Lake.....	500
Maysville, White Oak River.....	60	Turkeyfoot Lake.....	500
Mayworth, Duharts creek.....	*400	Batavia, Little Miami River, East Fork.....	300
Mebane, McIver's pond.....	400	Bellville, Clear Fork Creek.....	200
Milwaukee, Lake Kirby.....	1,000	Gatton's lake.....	100
Monroe, Aquadale Lake.....	200	Honey Creek.....	100
Austin's pond.....	200	Mohican River, Clear Fork.....	500
Baucum's pond.....	75	Cadiz, Chautauqua Lake.....	500
Buckhorn Falls Pond.....	*800	Canton, Timken Lake.....	300
Helms Lake.....	200	Columbus, Mount Air Lake.....	300
Mullis's pond.....	400	Defiance, Maumee River.....	200
Newsom's pond.....	200	Delhi, Runck's pond.....	100
Stump Lake.....	*400	Dundas, Benner Run.....	100
Morrisville, Sorrell's pond.....	400	Edon, Nettle Lake.....	200
Morven, Melton Pond.....	20	Fort Jennings, Rekart Quarry Pond.....	200
Mount Airy, Snow's pond.....	40	Galion, Sandusky River.....	300
Murphy, Grape Creek.....	2,500	Whetstone Creek.....	300
Hiawassee River.....	325	Geauga Lake, Geauga Lake.....	500
North Wilkesboro, Hunting Creek.....	*800	Georgetown, White Oak Creek.....	200
Moravian Creek.....	40	Lawshe, Brush Creek.....	200
Old Fort, Curtis Creek.....	2,500	Lima, McCullough Lake.....	100
Oriental, Smith's Creek.....	*400	Loveland, Little Miami River.....	300
Parkersburg, Johnson Mill Pond.....	150	Malvern, Big Sandy Creek.....	300
Patrick, Camp Creek.....	75	Mansfield, Mohican River, Black Fork.....	300
Pee Dee, Blewett Falls Pond.....	*1,200	Mohican River, Clear Fork.....	300
Pollockville, Trent River.....	60	Whetstone Creek.....	200
Raleigh, Buckhorn Falls Pond.....	*400	Millersburg, Kilbuck River.....	300
Roaring River, Roaring River.....	400	Mineral Ridge, Meander Creek.....	100
Upper Briar Creek.....	40	Minerva, Big Sandy Creek.....	300
Rocky Mount, Bynum's pond.....	*1,000	Morrow, Little Miami River, Todds Fork.....	200
Roseboro, Suggs Mill Pond.....	150	Mount Orab, Moberly-Roselott Pond.....	100
Roxboro, Bowes's pond.....	*200	Nowark, Buckeye Lake.....	400
Bradsher's pond.....	*200	New Philadelphia, One Leg Creek.....	300
Runion, Shelter Laurel Creek.....	1,500	Sugar Creek.....	300
Spruce Pine, Beaver Creek.....	75	Oneida, Big Sandy Creek.....	300
Grassy Creek.....	75	Paulding, Auglaize River.....	200
North Toe River.....	225	Portsmouth, Brush Creek.....	100
Star, Scout Pond.....	75	Little Scioto River.....	100
Statesville, Steele's pond.....	100	Ravenna, Lilly Park Pond.....	100
Sylva, Tuckaseegee River.....	4,550	Ripley, Eagle Creek.....	200
Whiteville, Black Mill Pond.....	*800	Russell Point, Indian Lake.....	200
Winston-Salem, Lake Katherine.....	*800	Shelby, Mohican River, Black Fork.....	200
	60	Tiffin, Sandusky River.....	300
		Troy, Great Miami River.....	200
		Uhricksville, Big Stillwater Creek.....	300
		Tuscarawas River.....	300
		Van Wert, Van Wert Lake.....	100
		Zanesville, Muskingum River.....	500
		Oklahoma:	
		Afton, Frisco Pond.....	1,000
		Alderson, Buck Lake.....	75
		Ardmore, Ardmore Club Lakes.....	180
		Chickasaw Lake.....	300
		Gill's pond.....	60
		Kinkade's lake.....	60
		New Lake.....	60
		North Lake.....	60
		Plainview Lake.....	60

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
Oklahoma—Continued.		Oklahoma—Continued.	
Boynton, Cobb Lake.....	20	Stigler, Waterworks Lake.....	90
Buffington, Illinois River.....	385	Stillwater, Thatcher's pond.....	200
Illinois River, Barron Fork.....	110	Yost Lake.....	300
Coalgate, Canyon Lake.....	90	Tishomingo, Big Sandy Creek.....	60
City Reservoir.....	40	Blue River.....	90
Harley Pond.....	20	Pennington River.....	90
Maxwell Pond.....	90	Rock Creek.....	90
M. K. & T. Pond.....	60	Waterworks Lake.....	60
Custer, Bruce's pond.....	140	Tulsa, Clearwater Lake.....	2,000
Graves's pond.....	70	Vinita, Mustang Creek.....	3,000
Neher's pond.....	70	Wanette, Scott's pond.....	*4,000
Schneider's pond.....	210	Wardville, Gantt's lake.....	60
Foyil, Skelton's pond.....	300	Wleetka, Buckley Pond.....	60
Grandfield, Little Blue Lake.....	115	Woodward, Beattie's pond.....	100
Natural Lake.....	115	Cline Lake.....	100
Guthrie, Bickford Lake.....	*6,000	Dillon's pond.....	100
Santa Fe Lake.....	*8,000	Green Lake.....	100
Hartshorne, Lake Savage.....	30	Hoge Lake.....	100
Hickory, Pond No. 16.....	36	McPherson Lake.....	100
Hobart, Northwest Lake.....	170	Nixon's lake.....	200
Indianoma, Baldwin's pond.....	70	Oal Lake.....	100
Ketchum, Thompson's lake.....	1,000	Osage Springs Lake.....	100
Konawa, Bermuda Lake.....	*4,000	Roundup Creek.....	100
Lindsay, Power's pond.....	*2,000	Sand Creek.....	100
McCurtain, San Bois Lake.....	100	Wyatt-Ferguson Lake.....	100
Manitou, Manitou Pond.....	70	Pennsylvania:	
Maramec, Maramec Lake.....	400	Annville, Quittapahilla Creek.....	125
Mill Creek, Brushy Creek.....	90	Swatara Creek.....	250
Buckhorn Creek.....	60	Baden, Douds's pond.....	125
Flood Creek.....	36	Bentleyville, Pigeon Creek, North Fork.....	400
Hickory Creek.....	36	Berwyn, Tarleton Pond.....	125
Mill Creek.....	90	Brackney, Quaker Lake.....	600
Mounds, Barton's lake.....	20	Bryn Mawr, Pembroke Pond.....	125
Muhall, Hunt's pond.....	*2,000	Bushkill, Forest Lake.....	300
Muskogee, Country Club Lake.....	300	Cambridge Spring, Edinboro Lake.....	200
Noble, Chickasaw Lake.....	*4,000	Chadds Ford, Patterson's pond.....	125
Oklahoma Lake.....	*4,000	Chambersburg, Conococheague Creek.....	200
Nowata, Tillottson's pond.....	1,000	Cherry Tree, Kneidler's pond.....	100
Oklahoma City, Granite Lake.....	*10,000	McKeage Pond.....	100
Lieneman's pond.....	*4,000	Chester, Sycamore Creek.....	125
Wright's pond.....	*4,000	Coogan Station, Lyscoming Creek.....	200
Okmulgee, Walker's pond.....	*2,000	Columbia, Chickies Creek.....	250
Orlando, Valley Pond.....	*2,000	Conneaut Lake, Conneaut Lake.....	800
Paoli, Willow Pond.....	*2,000	Denver, Brubaker Dam.....	125
Pauls Valley, Horseshoe Pond.....	*2,000	Bucher Dam.....	125
Republican Pond.....	*2,000	Cocalico Creek.....	125
Shady Pond.....	*4,000	Garrett Dam.....	125
Vaughn's pond.....	100	King Dam.....	125
Perry, City Lake.....	*4,000	Leeds Creek.....	125
Country Club Lake.....	*3,000	Leshar Dam.....	125
Cow Creek.....	200	Meckley Dam.....	125
Dormar's pond.....	100	Royer Dam.....	125
Hartman's lake.....	200	Shimp Dam.....	125
Long Slough Lake.....	100	Shober Pond.....	125
McFarlin's pond.....	200	Swamp Creek.....	125
McKinstry Pond.....	*2,000	Uibel Dam.....	125
Mullinex Pond.....	*2,000	Wegner Dam.....	125
Nelson's pond.....	100	Witmer Creek.....	125
New City Lake.....	200	Dinsmore, Herman Pond.....	200
Perry Pond.....	*5,000	Echo Lake, Echo Lake.....	200
Sokol Pond.....	100	Ephrata, Cocalico Creek.....	125
Treeman Lake.....	*4,000	Fahnestock Creek.....	125
Pittsburg, Lake Austin.....	*4,000	Little Muddy Creek.....	125
Pittsburg Pond.....	60	Middle Creek.....	125
Pryor, Hedrick's pond.....	40	Moyer Pond.....	125
Robbin, Illinois River, Barron Fork.....	*2,500	Upper Conestoga Creek.....	125
Shawnee, Baldwin Lake.....	2,000	Waw Bash Creek.....	125
Lowdan's lake.....	*4,000	Falls, Susquehanna River.....	300
Spino, Waterworks Lake.....	*2,000	Gettysburg, Big Marsh Creek.....	250
	90	Haines, Susquehanna River.....	625

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, a finger- lings, yearlings, and adults.	Disposition.	Fry, a finger- lings, yearlings, and adults.
Pennsylvania—Continued.		South Carolina:	
Harrisburg, Susquehanna River.....	600	Abbeville, Calhoun Creek.....	130
Huntingdon, Juniata River.....	750	Miller Mill Pond.....	130
Juniata River, Raystown Branch.....	125	Aiken, Bridge Creek Pond.....	1,000
Stony Creek.....	250	Hendrix's pond.....	100
Indiana, Yellow Creek.....	200	McElmurray's pond.....	1,500
Johnstown, Upper Stony Creek River.....	300	Stevens Creek.....	1,500
Jonestown, Little Swatara Creek.....	250	Tarrant's pond.....	1,540
Lackawaxen, Faust's pond.....	100	Wright's pond.....	1,000
Lancaster, Brooks Lake.....	125	Alcot, Stuckey's pond.....	150
Cocalico Creek.....	250	Anderson, Townsend Lake.....	1,000
Geiger's lake.....	125	Batesburg, Hartley's pond.....	500
Hammer Creek, Lower.....	125	Bethune, Cato's pond.....	1,000
Hunsecker Pond.....	125	Murchison Branch.....	500
Middle Creek.....	125	Blair, Broad River.....	2,950
Mill Creek.....	125	Blythwood, Rimer's pond.....	150
Paper Mill Pond.....	125	Sandfield Pond.....	150
Park Pond.....	125	Wooten's pond.....	500
Public Pond.....	125	Campobello, Atkins's pond.....	20
Lansdale, Spring Lakes.....	125	Caves, Johns Cross Roads Pond.....	1,000
Lewisburg, Beaver Run.....	100	Chester, Grassy Run.....	125
Buffalo Creek.....	200	Chesterfield, Gaddy's pond.....	75
Little Buffalo Creek.....	100	Columbia, Crane Creek Pond.....	1,000
Spruce Run.....	100	Messers Lake.....	2,500
Susquehanna River, West Branch.....	200	Percival Mill Pond.....	1,000
Turtle Creek.....	100	Poplar Pond.....	1,000
Meadville, Cussewago Creek.....	150	Dawkins, Broad River.....	1,150
French Creek.....	150	Broad River Pond.....	150
Woodcock Creek.....	150	Park Shoals Pond.....	150
Mill Hall, Big Fishing Creek.....	200	Due West, Long Branch.....	20
Fill Pond.....	200	Easley, Nally's pond.....	500
Milton, Loyalsock Creek.....	200	Edmund, Beaver Pond.....	500
Monaca, Raccoon Creek.....	250	Dreher's pond.....	100
Monocacy, Lewis's pond.....	125	Folley's pond.....	50
Muncy Valley, Eaglesmere Lake.....	500	Rikard's pond.....	1,000
New Galilee, Little Beaver Creek.....	150	Scouter Creek.....	1,000
New Milford, East Lake.....	200	Scouter Creek Pond.....	1,500
Oil City, President Run.....	600	Shumpert's pond.....	1,000
Sugar Lake.....	1,000	Enoree, Enoree River.....	40
Peach Bottom, Susquehanna River.....	125	Enoree River Pond.....	20
Pequea, Pequea Creek.....	250	Estill, Hamilton Ridge Mill Pond.....	20
Susquehanna River.....	250	Fairfax, Ritter Pond.....	40
Petersburg, Warrior Ridge Lake.....	250	Florence, Black Creek.....	4,000
Philadelphia, Crum Creek.....	250	Gilbert, Hamburg Pond.....	40
Quarryville, Hopkins Lake.....	125	Gray Court, Warrior River.....	130
Octoraro Creek.....	125	Greenville, Greens Lake.....	1,500
Reading, Maiden Creek.....	125	Laurens, Badgett Creek.....	20
Northkill Creek.....	250	Barksdale Pond.....	500
Red Hill, Perkiomen Creek.....	375	Beaverdam Creek.....	40
Rohrerstown, Little Conestoga Creek.....	250	Big Rabun Creek.....	60
Royersford, Mill Pond.....	250	Bush River, North Fork.....	500
Schuylkill River.....	250	Cotton Mills Lake.....	40
Stony Run.....	250	Dial Creek.....	40
Sabula, Sabula Lake.....	200	Dirty Creek.....	40
Scranton, Gravel Lake.....	200	Duncan Creek.....	1,000
South Danville, Susquehanna River.....	200	Fleming Branch.....	40
Standing Stone, Susquehanna River.....	200	Holmes Creek.....	1,000
Stroudsburg, McMichael Creek.....	200	Indian Creek.....	20
Sunbury, Susquehanna River.....	200	Lick Creek.....	40
Thompson, Wrighter Lake.....	200	Little River, Branch of.....	40
Titusville, Oil Creek.....	600	Madden Creek.....	1,500
Trout Run, Lycoming Creek.....	200	Mill Creek.....	20
Tucquan, Susquehanna River.....	250	Moore Creek.....	1,000
Waterville, Big Pine Creek.....	200	Petsland Creek.....	1,000
Little Pine Creek.....	200	Reedy River.....	1,000
Williamsburg, Juniata River.....	200	South Reedy Fork Creek.....	40
Williamsport, Loyalsock Creek.....	200	Taylor Creek.....	500
Wind Ridge, Wheeling Creek, South Fork.....	400	Wall Pond.....	500
Porto Rico: San Juan, Carite Reservoir.....	600	Walnut Creek.....	1,000
Rhode Island:		Leesville, Adam's pond.....	500
Pascoag, Pascoag Lake.....	100	Smith's pond (A).....	500
Providence, Waterman Reservoir.....	300	Smith's pond (B).....	40
West Kingston, Yaugoo Pond.....	200	Lexington, Laurel Falls Lake.....	40
		Mathias's pond (A).....	1,000
		Mathias's pond (B).....	1,000

a Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
South Carolina—Continued.		Tennessee—Continued.	
Lowrys, Robbin's pond.....	500	Chapel Hill, Duck River.....	*4,000
Meredith, Beaverdam Pond.....	3,000	Clarksville, Fletcher Fork Creek.....	500
Monetta, Cato's pond.....	500	College, Sequatchie River.....	80
Jordan's pond (A).....	500	Dechard, Ducare Pond.....	500
Jordan's pond (B).....	500	Estill Springs, Elk River.....	900
Monroe, Hursey Pond.....	2,000	Fayetteville, Elk River.....	{ *1,500
Moore, Whites Creek.....	225	Norris Creek.....	9,350
Mount Croghan, McGregor's pond.....	150	Long's pond.....	*1,000
Mill Branch.....	500	Huntingdon, Dill's pond.....	200
Springwater Pond.....	1,000	Jackson, Lake Louise.....	100
Neece, Livingston's pond.....	1,500	Johnson City, Watauga River.....	100
North, Craft's pond.....	1,000	Kingston Springs, Harpeth River.....	450
Orangeburg, Corcor Swamp Pond.....	500	Knoxville, Limestone Lake.....	1,000
Farnum Pond.....	1,500	Lewisburg, City Lake.....	400
Fishery Branch.....	2,500	Lone Mountain, Limestone Creek.....	*4,000
Four Mile Branch Pond.....	1,000	McKenzie, Weeping Willow Pond.....	80
North Edisto River.....	10,000	McMinnville, Barren Fork Creek.....	1,600
Sims's pond.....	1,000	Caney Fork Creek.....	500
Smooks Pond.....	1,000	Charleys Creek.....	1,500
Pageland, Hursey Pond.....	150	Collins River.....	500
Pelion, Fort Pond.....	100	Hickory Creek.....	1,500
Gantt's pond (A).....	100	Mountain Creek.....	1,000
Gantt's pond (B).....	100	Maryville, Lake Sidney Lanier.....	1,000
Gantt's pond (C).....	1,000	Moscow, Oak Lake.....	200
Lucas's pond.....	250	Murphreesboro, Stone River.....	35
Rawls's pond.....	100	Nashville, Lake Clara.....	800
Rayflin, Chalk Hill Pond.....	1,000	Stone River.....	1,000
Gantt's pond.....	500	Newport, Pigeon River, East Fork... Riverside, Buffalo River.....	1,000
Ridge Spring, Bog Branch.....	1,000	Little River.....	60
Cullom's pond (A).....	1,000	Rogersville, Caney Creek.....	1,000
Cullom's pond (B).....	1,000	Crockett Creek.....	365
Jordan's pond.....	1,000	Shelbyville, Duck River.....	275
Lotis Creek.....	500	East Mulberry Creek.....	255
McTier Creek.....	500	Springfield, Sycamore Creek.....	1,500
Mill Creek.....	50	Stanton, Tucker's pond.....	900
Rocky Springs Creek.....	500	Tate, Bean Creek.....	1,000
Strother's pond.....	40	Briary Fork Creek.....	150
Rock Hill, Arcade Pond.....	40	Garretts Blue Lake.....	150
Rockton, Castles's pond.....	75	Proffett Creek.....	75
St. Matthews, Little Beaver Creek.....	1,000	Tazewell, Barron Creek.....	80
Salley, Gunter's pond.....	1,500	Townsend, Little River.....	20
Sharp, Tompkins Pond.....	500	Trenton, Forked Deer River, North Fork.....	725
Society Hill, Rocky Dundee Ponds.....	2,000	Tullahoma, Motlow's mill pond.....	*2,000
Springfield, Dean Swamp Pond.....	1,000	Wartrace, Duck River, Garrison Fork Wartrace Creek.....	900
Strother, Broad River.....	150	Whitwell, Looneys Creek.....	900
Swansea, Bull Swamp Pond.....	1,500		20
Jackson's pond.....	40		
Jeffcoat's pond.....	40		
Third Pond.....	1,000		
Trenton, Beaverdam Pond.....	1,000		
Bouknight's pond.....	1,000		
Boynhams Pond.....	1,000		
Horns Creek Pond.....	1,000		
Longs Pond.....	1,000		
Salter's pond.....	40		
Smith Pond.....	1,500		
Wagner, Giddy Swamp Pond.....	1,500		
Westminster, Knox Creek.....	130		
White Pond, Owens Pond.....	500		
Sicurrin's pond.....	100		
Windsor, Bonnett's pond.....	1,500		
Woodford, Jeffcoat's pond.....	500		
Yorkville, Wallace's pond.....	500		
Waterworks Pond.....	500		
South Dakota:			
Belvidere, Addison's pond.....	200		
Capa, Capa Lake.....	300		
McCook, McCook Lake.....	300		
Morristown, White Deer Creek.....	600		
Pukwana, Red Lake.....	300		
Tripp, North Star Pond.....	100		
Tennessee:			
Arlington, O. K. Pond.....	100		
Ashland City, Sycamore Creek.....	1,000		

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
Texas—Continued.		Texas—Continued.	
Brady, Bluff Creek.....	250	Detroit, Club Lake.....	1,000
Brady Creek.....	1,525	East Lake.....	1,500
Cow Creek Lake.....	125	Oil Mill Pond.....	1,000
Live Oak Creek.....	175	Red Pond.....	1,000
Brandenburg, Brandenburg Lake.....	4,000	Union Grove Pond.....	1,000
Brenham, Club Lake.....	2,300	Wards Pond.....	1,000
Parker's lake.....	561	Dibell, Everglade Pond.....	100
Bremond, Flag Lake.....	600	Dilley, Lake Cory.....	50
Brownsville, Calumet Pond.....	1,000	Dundee, Griffin Lake.....	2,000
Country Club Lake.....	1,260	Eastland, Lake Tilman.....	50
Resaca de la Palma.....	1,000	Lyler's pond.....	60
Brownwood, Anderson's pond (A).....	1,000	Edgewood, Gin Lake.....	800
Anderson's pond (B).....	256	Scott's pond.....	1,000
Clark's pond.....	256	Edna, Goose Lake.....	100
Day's pond.....	256	Kerr Lake.....	615
Forsythe's pond.....	1,000	Elgin, Clifton's pond.....	400
Home Lake (A).....	1,000	El Paso, Railroad Pond.....	100
Home Lake (B).....	43	Enloe, McCarty's pond.....	115
Lake Alba.....	2,000	Ennis, Anderson Ranch Pond.....	800
Ovalo Lake.....	256	Latimer Lake.....	800
Shipman's pond.....	128	Estelle, Matador Lake.....	1,800
Simmon's lake.....	1,000	Fant City, Demonstration Farm Pond.....	56
Brundage, Moore's pond.....	250	Farmersville, Strong Pond.....	900
Burnett, Hamilton Creek.....	1,301	Fentress, San Marcos River.....	300
Caldwell, Matcek's pond.....	180	Ferris, Lloyd's pond.....	400
Calvert, Parkinson's pond.....	400	Nolen's pond.....	400
Cameron, Barton's pond.....	200	Flatonia, Hake's lake.....	50
Bergum's lake.....	100	Fletcher, Village Creek.....	5,000
Dairy Lake.....	1,000	Floyd, Club Pond.....	2,000
Lake Cameron.....	200	Fort Worth, Lake Hearst.....	2,200
Roth's pond.....	200	Magnolia Lake.....	435
Willow Lake.....	1,000	Frisco, Clarks Lake.....	400
Cary, Gaither's pond.....	2,700	Lake Bonnie.....	550
Celeste, Williams Pond.....	900	Garrison, Erwin's lake.....	150
Center, Clear Lake.....	50	Gatesville, Cow House Creek.....	896
Hearn Pond.....	100	Georgetown, Ganns Mill Lake.....	2,000
Hurst's pond.....	1,000	San Gabriel River and branches.....	1,900
Kelly Lake.....	800	Giddings, Fischer's pond.....	800
Kennedy's pond.....	1,000	Holman's pond.....	400
Lawson's pond.....	1,000	Raube's pond.....	800
Napier's pond.....	1,000	Schneider's pond.....	400
Sand Spring Branch.....	100	Whitter Pond.....	400
Christine, Norwood Lake.....	400	Gilmer, Davis Lake.....	2,950
Clarksville, Bledsoe's pond.....	1,000	Green Lake.....	50
Cleburne, Club Lake.....	11,930	Robertson Lake.....	600
Clifton, Meridian Creek.....	170	Simpson Lake.....	50
Columbus, Glendale Pond.....	55	Smith Lake.....	4,750
Wooten's pond.....	100	Tanglewood Lake.....	2,000
Concord, Brown's lake.....	2,000	Goree, Goree Pond.....	2,000
Cooledge, McCoy's pond.....	500	Graford, Loving Creek.....	170
Corsicana, Magnolia Ponds.....	200	Grandview, Club Lake.....	2,090
Coughran, Green Lodge Lake.....	250	Grapeland, Gee's pond.....	700
Crandall, Bluewater Lake.....	800	Myrtle Lake.....	150
Crockett, Glenn's pond.....	75	Persimmon Lake.....	1,540
Grounds Lake.....	700	Whitiker's pond.....	1,500
Hollywood Lake.....	1,350	Greenbrier, Brewster Creek.....	100
Rice Lake.....	50	Greenbrier Lake.....	50
Crystal City, Taft's pond.....	76	Grigsby, West's pond.....	750
Winter Garden Lake.....	2,535	Harold, McClelland's pond.....	900
Cuero, Club Lake.....	100	Haskell, Three W Ranch Pond.....	1,000
Cuero Creek.....	1,000	Henderson, Dickinson Lake.....	750
Deer Creek.....	2,200	Dulin Pond.....	760
Guadalupe River.....	400	Howland, Jones Lake.....	115
Irish Creek.....	800	Hughes Springs, Milner's pond.....	1,400
Lake No. 1.....	200	Jacksboro, Beck Pond.....	800
McCoy's Creek.....	1,000	Carroll Creek.....	1,950
Thomas Creek.....	1,000	East Keechi Creek.....	1,600
Dangerfield, Martin's pond.....	2,400	Hensley Lake.....	800
Dallas, Kidd Spring Pond.....	200	Knox's lake.....	135
De Kalb, Jones Lake.....	1,000	Mountain Lake.....	800
Del Rio, Cienegas Creek.....	300	Rummage Lake.....	800
Devils River.....	4,655	Jayton, Long's pond.....	1,000
Denton, Wilkison's pond.....	1,250	Jourdanton, Hagelstein Pond 69.....	400

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, and adults.
Texas—Continued.		Texas—Continued.	
Justin, Denton Creek	825	Palacios, McDonald's pond	75
Kaufman, Brown's pond	500	Paris, Bauman's pond	500
Carlateright Lake	800	Gordon Club Lake	340
Cartwright's pond	60	Igo's pond	500
Coleman Gin Pond	700	Johnsons Lake	1,500
Meadow Pond	60	Lake Virginia	1,000
Spikes's pond	500	Timber Lake	500
Terry's pond	800	Petrolia, Lake Cullinan	3,600
Kemp, Hurley's pond (A)	800	Petty, Collier's pond	500
Hurley's pond (B)	800	Maness's pond	250
Kerrville, Beck Pond	460	Willow Pond	250
Guadalupe River	2,150	Pilot Point, Emberson's lake	900
Harris Pond	636	Pittsburg, Davis Club Lake	300
Schreiner's pond	636	Plainview, Lake Plainview	3,000
Sherman Mill Pond	2,000	Point, Horton's pond	900
Wachter Pond	636	Jones's pond	115
Kingsville, Santa Gertrudis Creek	2,000	Randolph, Randolph Pond	425
Kirbyville, Cow Creek	3,000	Ranger, Bruce Pond	60
Krum, Ram Ranch Lake	270	Hodges Pond	60
La Coste, Medina River	150	Weaver Pond	60
Lancaster, Country Club Lake	2,000	Reisel, Goodman's pond	400
La Rue, Oak Heights Lake	1,600	Richland, Swink's pond	50
La Vernia, Cibolo River	100	Roaring Springs, Reeves's pond	900
Leesville, Lenahan Lake	* 3,000	Rockdale, Rock Lake	130
Lincoln, Proske's pond	325	Roscoe, Grantham Pond	100
Linden, Hedges Mill Pond	500	Round Rock, Lake Creek	4,750
Livingston, Lawrence's pond	50	San Antonio, Mahucke Park Ponds	3,750
Lockhart, Lockhart Branch	115	San Antonio River	11,050
Lone Oak, Hughes Pond	900	San Augustine, Jones's pond	100
Schenck's pond	900	Sandy Point, Palo Alto Lake	3,000
Longview, Echols Lake	150	Sanger, Duck Creek	550
Hipsidom Lake	225	San Marcos, Blanco River	400
Luling, San Marcos River	150	Dedeke Pond	200
Mabank, Cotton Mill Lake	800	San Marcos River	404
Old Gin Lake	1,000	San Marcos River, Davis Hole	400
Osbornes Resort Pond	800	Woods Bend Creek	400
Tynes's pond	800	Sarita, Los Palomas Lake	700
McDade, Owen Lake	400	Sayers, Big Sandy Creek	4,000
McKinney, Cleveland's pond	115	Little Sandy Creek	3,000
Club Lake	2,000	Sealy, San Bernardino Lake	4,596
Manor, Hulin Springs Pond	105	Shamrock, Coburn Pond	900
Marble Falls, Marble Falls Lake	1,000	Masterson Pond	900
Marfa, Gem Pond	100	Smithville, Harbicht Lake	1,800
Marshall, Craver's Lake	2,000	Jones's lake	150
Peden's pond	900	Snyder, Scoggin's pond	1,000
Maud, Helms's pond	200	Staples, San Marcos River	300
Maypearl, Golladay's pond	700	Steep Creek, Chinquapin Creek	1,050
Menard, Augustine Creek	869	Hines's lake	50
Callans Big Lake	869	Stephenville, Sycamore Creek	1,625
Celery Creek	1,738	Streetman, McConnell's pond	40
Clear Creek	869	McDaniel's pond	40
Dry Creek	869	Milligan's pond	30
Elm Creek	1,738	Sugar Land, Cleveland Lake	100
Rocky Creek	1,738	Sulphur Springs, Brown Lake	1,000
San Saba River	625	Buford Lake	230
San Saba River, Hubbells Dam	1,738	Coapland Lake	900
Sheens Branch	869	Elberta Lake	3,041
South Elm Creek	1,738	France's lake	900
Streigler Lake	100	Lake Buford	1,400
Mercury, Corn Creek	125	Lake Tatam	1,400
Miami, Jeffus's pond	1,000	Pierce's pond	1,000
Mineral Wells, Corn Pond	170	Roberts's pond	900
Eagle Creek	1,600	Rock Crusher Lake	2,800
Ioni Creek	1,285	Smith Lake	2,000
Mount Pleasant, Meadowbrook Pond	2,700	Sweetwater, Lake Trammell	2,000
Mount Vernon, Hill's pond	115	Swenson, Headquarter Lake	2,000
Murchison, Moore Lake	600	Taylor, Washington Heights Pond	1,200
Nacogdoches, Sheppard Lake	170	Teague, Hines Lake	1,425
South End Lake	515	Middleton Pond	2,500
Naples, Naples Lake	50	Whaley's pond	2,000
Neuville, Fults's pond	50	Terrell, Bond's pond	1,000
New Braunfels, Comal River	6,970	Williams's pond	1,000
Olmco, Elm Creek	2,340	Texarkana, Horseshoe Lake	550
Paducah, Cook's pond	900	Temple's pond	400

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, and adults.
Texas—Continued.		Virginia—Continued.	
Thorndale, Elliott's pond.....	2, 200	Carrsville, Holland's pond.....	100
Heintze's pond (A).....	800	Chesterfield, Cogbill's pond.....	300
Heintze's pond (B).....	700	Coan, King's pond.....	100
Lee's pond.....	800	Coeburne, Guets River.....	210
Newton's pond.....	700	Cohoke, Cohoke Pond.....	600
Watkins's pond.....	700	Covington, Dunlap Creek.....	150
Thrall, Stiles's lake.....	65	Jackson River.....	70
Timpson, Bridwell's pond.....	200	Duffield, Tompkins's pond.....	140
Lake of the Woods.....	215	Fair Oaks, Hicks's pond.....	300
Tolbert, Cobb's pond.....	900	Fredericksburg, Pulliam's pond.....	150
Tyler, Rowlands Lake.....	300	Gainesville, Catharpin Creek.....	100
Uvalde, Chalk Bluff Pond.....	75	Little Bull Run.....	80
Dry Frio River.....	115	Gordonsville, Brackett's pond.....	150
Eagle Pass Pond.....	300	Gretna, Whitethorn Creek.....	150
Eight Mile Lake.....	75	Guinea, Clear Lake.....	450
Frio River.....	115	Morris's pond.....	150
Kincaid Dam Pond.....	115	Payne's pond.....	450
La Pryor Pond.....	75	Ta River.....	450
Leona River.....	100	Harrisonburg, Nicolas's pond.....	125
Nueces River.....	175	Silver Lake.....	1, 500
Pulliam Ranch Pond.....	115	Hot Springs, Jackson River.....	70
Ranger Lake.....	1, 050	Jarratt, Pedneau's pond.....	100
Tom Nunn Pond.....	75	Lawrenceville, Meherrin River.....	800
Turkey Creek.....	1, 400	Lester Manor, Club Pond.....	450
Vernon, Long's pond.....	900	Lofton, Lilley's pond.....	500
Muller Lake.....	900	Maidens, Carlisle Pond.....	1, 000
Spring Lake.....	2, 700	Manassas, Ocoquan Creek, Upper.....	80
Waco, Cooper's lake.....	90	Martinsville, Smith River.....	450
Everman Lake.....	600	Max Meadows, Reed Creek.....	1, 500
Farrish's pond.....	950	Middletown, Cedar Creek.....	250
Whitesboro, Clark Lake.....	200	Milford, Kenbrook Pond.....	150
Whitewright, Farroy's pond.....	1, 000	Mount Crawford, North River.....	200
Whitney, Deep Pond.....	50	Nathalie, Martin's pond.....	100
Live Oak Lake.....	50	New Market, Shenandoah River, North Fork.....	2, 000
Wichita Falls, Avis Lake.....	1, 200	Oak Ridge, Oak Ridge Lake.....	150
Lone Star Lake.....	1, 200	Pemberton, Johnson-Duncan Pond.....	150
West Lake.....	1, 200	Whiteville Pond.....	1, 500
Wichita Club Lake.....	2, 400	Muddy Creek Pond.....	300
Wills Point, Beck Lake.....	1, 450	Pembroke, Mountain Lake.....	350
Blitz Pond.....	1, 000	Penola, Camps Pond.....	150
Bone Lake.....	1, 600	Plains, Goose Creek.....	2, 000
Brundidge Lake.....	1, 200	Richmond, Jolly Mill Pond.....	300
Ennis Lake.....	2, 050	Salem, Roanoke River.....	750
Fish Lake.....	1, 250	Saunders Wharf, Spindle's mill pond.....	100
Fish Tail Lake.....	2, 400	Staunton, Middle River.....	450
Lake Charles.....	2, 900	Stephens City, Bartonsville Dam.....	100
Lake Gilchrist.....	1, 600	Klines Dam.....	175
Lake Payne.....	1, 250	Shenandoah River.....	150
McKee Pond.....	900	Strasburg, Shenandoah River, North Fork.....	200
Nugent Lake.....	2, 250	Suffolk, Darden's mill pond.....	200
Reagan Pond.....	500	Lake Savage.....	1, 200
Roddy Lake.....	1, 250	Summit, Massaponax Church Pond.....	150
Swank Lake.....	1, 200	Taylorville, Beech Branch Lake.....	150
Windom, Shelley Pond.....	250	Tazewell, Clinch River, Maiden Spring Fork.....	140
Winnsboro, Bell Lake.....	900	Toms Brook, Shenandoah River, North Fork.....	2, 000
Popes Lake.....	1, 000	Walker Ford, James River.....	2, 000
Winona, Driskell Pond.....	300	Waverly, Harrison Pond.....	400
Vermont:		Shady Grove Lake.....	500
Barton, Parker Pond.....	100	West Point, Goddin's pond.....	300
Ely, Fairlee Lake.....	200	Marston's mill pond.....	300
Hydeville, Lake Bomosen.....	200	Rays Neck Mill Pond.....	300
Island Pond, Railroad Pond.....	100	Winchester, Opequan Creek.....	250
Lyndonville, Chandler Pond.....	100	Windsor, Bradshaw's pond.....	300
Virginia:		Turner's pond.....	100
Adams Grove, Williams's pond.....	100	Winston-Salem, Mountain Run.....	40
Ashby, Shenandoah River.....	1, 600	Woodsland, Pugh's pond.....	50
Basic City, South River.....	1, 600	Wytheville, Reed Creek, South Fork.....	1, 500
Beaverdam, Thompson's pond.....	150	West Virginia:	
Ben Hur, Powells River.....	210	Beury, New River.....	70
Berryville, Shenandoah River.....	200	Bramwell, Bluestone River.....	80
Blackstone, Belmont Pond.....	300		
Boyce, Shenandoah River.....	1, 600		
Bremo Bluff, McKenna Pond.....	1, 000		
Bridgewater, North River.....	150		

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> fingerlings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> fingerlings, yearlings, and adults.
West Virginia—Continued.		Wisconsin—Continued.	
Clarksburg, West Fork River.....	300	Fond du Lac, Lake de Neveu.....	200
Elkins, Tygarts Valley River.....	105	Mullet Lake.....	300
Groves, Big Buffalo Creek.....	70	Gagen, Round Lake.....	400
Birch River.....	70	Gleason, Echo Lake.....	300
Huntington, Guyandotte River.....	120	Glidden, Torrey Lake.....	200
Keyser, Patterson Creek.....	400	Gordon, Bass Lake.....	200
Martinsburg, Opequon Creek.....	150	Clear Lake.....	200
Potomac River.....	150	Metzger Lake.....	200
Middletown, Middle Island Creek.....	600	Ox Lake.....	200
Mullens, Guyandotte River.....	200	Swenson Lake.....	200
Oral, Oral Lake.....	800	Grand Rapids, Wisconsin River.....	600
Parsons, Cheat River, Shavers Fork.....	150	Hancock, Fish Lake.....	200
Paw Paw, Great Cacapon River.....	250	Hartford, Frieses Lake.....	100
Phillippi, Buckhannon River.....	70	Mud Lake.....	100
Tygarts Valley River, Middle Fork.....	70	Murphy Lake.....	200
Raleigh, Glade Creek.....	70	Pike Lake.....	200
Piney River.....	70	Hayward, Clover Lake.....	200
Romney, Potomac River, South Branch.....	300	Grindstone Lake.....	100
Shepherdstown, Potomac River.....	160	Ishum Lake.....	100
Springfield, Potomac River, South Branch.....	95	Martin Lake.....	100
Wheeling, Wheeling Creek.....	400	Moose Lake.....	100
Wisconsin:		Namakagon Lake.....	100
Arcadia, Lake Idlewild.....	300	Namakagon River.....	100
Silver Lake.....	200	Patrick Lake.....	200
Spring Lake.....	200	Rodeman Lake.....	200
Barneveld, Aavang Creek.....	200	Shue Lake.....	100
Duffey Creek.....	200	Slim Lake.....	100
Jones Valley Creek.....	200	Spring Lake.....	100
Mile Pond.....	200	Thayer Lake.....	100
Oimoon Creek.....	200	Williams Lake.....	200
Tvedt Creek.....	200	Hazelhurst, Lake Katherine.....	200
Urbain Creek.....	200	Hitterdal, Lake Wilson.....	600
Barron, Manitou Lake.....	200	Holcombe, Kappa Lake.....	200
Birchwood, Birch Lake.....	200	Round Lake.....	200
North Lake.....	200	Janesville, Rock River.....	400
Bloomer, Bass Lake.....	200	Kilbourn, Wisconsin River.....	400
Boyd, Big Hay Creek.....	200	La Crosse, French Lake.....	200
Pike Lake.....	200	Joe Lynn Creek.....	200
Butternut, Hoffman Lake.....	200	Ladysmith, Flambeau River.....	200
Luebke Lake.....	200	Hemlock River Pond.....	200
Morse Lake.....	200	Pekegama Lake.....	200
Mud Lake.....	200	Pulasky Lake.....	200
Parker Lake.....	200	Twin Lakes.....	200
Pine Creek.....	200	Lake Beulah, Lake Beulah.....	400
Richter Creek.....	200	Lake Mills, Rock Lake.....	200
Sickle Lake.....	200	Laona, Birch Lake.....	200
Cable, Big Rosa Lake.....	200	Riley Lake.....	300
Namakagon Lake.....	200	Lyndhurst, Beaulieu Lake.....	100
Williams Lake.....	200	Big Lake.....	150
Cedarburg, Cedar Creek.....	600	Gardner Lake.....	250
Milwaukee River.....	600	Island Lake.....	150
Centuria, Long Lake.....	200	Miller Lake.....	150
Chippewa Falls, Duncan Creek.....	200	Moon Lake.....	150
Popple Lake.....	200	Schmidt Lake.....	150
Coloma, Cartis Lake.....	200	Slinin Lake.....	150
Splitgaber Lake.....	500	Manitowoc, English Lake.....	300
Crandon, Dry Lake.....	200	Glombsky Lake.....	300
Rice Lake.....	200	Goss Lake.....	100
Stone Lake.....	200	Hartlaub Lake.....	400
Donaldson, Big Bass Lake.....	600	Hempton Lake.....	400
Lac Vieux Desert.....	600	Kastbaum Lake.....	300
Moccasin Lake.....	800	Lutzise Lake.....	400
Mud Lake.....	600	Schisel Lake.....	400
Spring Lake.....	600	Silver Lake.....	150
Drummond, Spring Lake.....	400	Mason, Phantom Lake.....	200
Eagle Point, Rasmus Pond.....	200	Mattoon, Baker Lake.....	400
Eau Claire, Twin Island Lakes.....	500	Johnson Lake.....	200
Eggleston Crossing, Stevens Lake.....	300	Mitchell Lake.....	200
Eland, Birchwood Lake.....	3,800	Moose Lake.....	200
Lake Go To It.....	200	Mauston, Lemonweir River.....	300
Elkhart Lake, Crystal Lake.....	800	Mayville, Rock River.....	300
Elk Mound, Cedar Falls Lake.....	300	Medford, Lake Esadore.....	200
Fifield, Jupa Lake.....	200	Mellen, Loon Lake.....	200
Round Lake.....	200	Menomonie, Atlasta Lake.....	200
		Chippewa River.....	370

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## LARGEMOUTH BLACK BASS—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, yearlings, and adults.
Wisconsin—Continued.		Wisconsin—Continued.	
Menomonie, Downsview Lake.....	200	Sparta, Perch Lake.....	200
Dunnville Lake.....	200	Walworth Pond.....	200
Hoolid Lake.....	200	Spider, Smith Lake.....	400
Pitt Lake.....	200	Spread Eagle Lakes, Spread Eagle	
Red Cedar River.....	200	Lakes.....	550
Wilson Lake.....	200	Stanley, Diamond Lake.....	200
Yellow Bank Lake.....	200	Jump River.....	250
Youngs Lake.....	200	Yellow River.....	250
Nashville, Dry Lake.....	200	Star Lake, Ballard Lake.....	200
Horseshoe Lake.....	200	Little Muskellonge Lake.....	200
Norrie, Bass Lake.....	200	Sweden, Beaver Lake.....	200
Lake Go To It.....	300	Three Lakes, Barrard Lake.....	155
Mud Lake.....	200	Big Lake.....	155
Pike Lake.....	200	Big Fork Lake.....	155
North Freedom, Schramm Mill Pond.....	200	Big Stone Lake.....	155
Okauchee, Okauchee Lake.....	1,000	Bonner Lake.....	155
Owen, Black River.....	200	Butternut Lake.....	150
Popple River.....	200	Columbus Lake.....	150
Pelican Lake, Pelican Lake.....	300	Cook Lake.....	155
Phelps, Big Twin Lake.....	300	Dog Lake.....	155
Little Twin Lake.....	200	Hutchinson Lake.....	155
Phillips, Crane-Chase Lake.....	200	Island Lake.....	155
Deer Lake.....	200	Little Fork Lake.....	155
Poynette, Poynette Mill Pond.....	200	Lost Lake.....	155
Prairie du Chien, Mississippi River.....	1,500	Medium Lake.....	155
Random Lake, Random Lake.....	400	Mud Lake.....	155
Spring Lake.....	400	One Stone Lake.....	155
Reedsburg, Baraboo River.....	300	Planting Ground Lake.....	150
Hay Creek.....	100	Round Lake.....	150
Rhineland, Bass Lake.....	200	Thunder Lake.....	155
Faust Lake.....	200	Townline Lake.....	155
Lake Creek.....	200	Tomahawk, Deer Lake.....	200
Mill Lake.....	200	Lake Clara.....	200
Sugar Camp Lake.....	200	Mirror Lake.....	200
Wisconsin River.....	200	Somo River.....	200
Rice Lake, Balsam Lake.....	300	Spirit River.....	200
Barry Lake.....	100	Tomahawk River.....	200
Beaver Lake.....	100	Wisconsin River.....	200
Carter Lake.....	150	Trevor, Rock Lake.....	200
Desair Lake.....	150	Waukesha, Little Muskego Lake.....	200
Devils Lake.....	150	Popple Creek.....	200
Long Lake.....	225	Waupaca, Bass Lake.....	200
Quince Lake.....	100	Goose Neck Lake.....	200
Rice Lake.....	100	Loon Lake.....	200
Silver Lake.....	100	McClain Lake.....	200
Tussock Lake.....	150	Wausau, Croched Lake.....	200
Richtland Center, Bowen Mill Pond.....	50	Eau Claire River.....	400
Excelsior Mill Pond.....	50	Lake Wausau.....	600
Ithaca Mill Pond.....	50	Pine River.....	200
Lone Rock Mill Pond.....	50	Rib River.....	200
Mill Creek.....	50	Road Lake.....	200
Mill Pond.....	50	Short Portage Lake.....	600
Rodolph Mill Pond.....	50	Wisconsin River.....	400
Sextonville Mill Pond.....	50	Wautoma, Bugh Lake.....	200
Sayner, Plum Lake.....	300	Waverly, Waverly Lake.....	300
Shawano, Keshena Lake.....	400	West Bend, Silver Lake.....	300
Lamotte Lake.....	400	Whitehall, Trempealeau River.....	300
Loon Lake.....	400	Whitewater, Green Lake.....	200
Round Lake.....	400	Middle Lake.....	200
Sandy Lake.....	400	Mill Lake.....	200
Sullivan Lake.....	400	Turtle Lake.....	200
Sheboygan, Coetzer Lake.....	200	Whitewater Lake.....	200
Pigeon River.....	200	Winter, Barber Lake.....	200
Sheboygan Falls, Sheboygan River.....	200	Barker Lake.....	200
Shell Lake, Big Ripley Lake.....	200	Bass Lake.....	200
Chain of Lakes.....	200	McDonald Lake.....	200
Devils Lake.....	200	Woodland, Neosho Mill Pond.....	200
Little Long Lake.....	200	Wyoming:	
Shell Lake.....	600	Cheyenne, Lake Minnehaha.....	200
Solon Springs, Black Fox Lake.....	200	Sloan's lake.....	200
Deer Print Lake.....	200	Gillette, Burlington Lake.....	250
Sparta, Angelo Pond.....	200		
Depot Pond.....	150		
La Crosse River.....	100		
Paper Mill Pond.....	200		
		Total <sup>b</sup> .....	f *471,300 1,357,768

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.<sup>b</sup> Lost in transit, 12,006 fingerlings; 500 fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## SUNFISH.

Disposition.	Fry, <sup>a</sup> finger- lings, year- lings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, year- lings, and adults.
Alabama:		Alabama—Continued.	
Andalusia, Henderson's pond.....	200	Talladega Springs, Sapsucker Creek...	200
Radford's pond.....	200	Sulphur Branch.....	300
Anniston, Cane Creek, tributary of.....	200	Tennille, Breastwood's pond.....	300
Sam McCluskin Pond.....	100	Tyson, James Pond.....	200
Ariton, Ziglar's pond.....	200	Oak Lea Pond.....	100
Ashby, Oak Hill Pond.....	300	Tuscaloosa, Nabers's pond.....	40
Attalla, Brasher's pond.....	100	Stewart Lake.....	200
Bangor, Blue Hole Lake.....	300	Arizona:	
Bessemer, West Lake.....	600	Gleeson, Gibson's pond.....	50
Birmingham, Barrett's pond.....	300	San Simon, Bartlett's pond.....	50
Clark's pond.....	400	Homrighausen's pond.....	50
Doster's pond.....	200	McLarty's pond.....	50
Rock Quarry Lake.....	200	Morrow's pond.....	50
Wilson Lake.....	300	Sunflower Ranch Pond.....	50
Brierfield, Shoals Creek.....	600	Arkansas:	
Caldwell, Pleasant Hill Mill Pond.....	200	Emerson, McDonald's pond.....	500
Carrollton, Lubbeck Pond.....	800	Gravette, Austin's pond.....	2,000
Lubbub Creek.....	800	Greenwood, Harper's pond.....	4,000
Clayton, Blue Hole Pond.....	200	Townley's pond.....	1,000
Nix's pond.....	400	Hot Springs, Bull Creek.....	3,000
Thomas's pond.....	400	Fordyce Lake.....	3,000
Cordova, Black Warrior River.....	1,000	Little Rock, Crystal Pond.....	1,000
Cullman, Fronhold's pond.....	100	Magnolia, Benvenue Pond.....	1,000
Tucker's pond.....	100	Goode's pond.....	2,000
Dancy, Clark's pond.....	450	Puckett's pond.....	500
Virginia Lake.....	450	Waller's pond.....	1,000
Dozier, Moore's pond.....	200	Subiaco, Subiaco Lake.....	2,000
Pine Root Pond.....	200	Florida:	
Evergreen, Tanner's pond.....	100	DeFuniak Springs, Gum Pond.....	600
Falkville, Flint Creek.....	400	Murphy's pond.....	400
Fayetteville, Davis Branch.....	300	East Lake, Lake Weir.....	600
Gadsden, Nocolula Creek.....	300	Graceville, Snell's pond.....	500
Greensboro, Ramey's pond.....	150	Tampa, Clearwater Pond.....	150
Stickney's pond.....	200	Pinetta, Alcyone Pond.....	300
Greenville, Hillcrest Pond.....	250	Elbow Lake.....	600
Headland, Brackin's pond (A).....	100	Redman, Redman Pond.....	200
Brackin's pond (B).....	150	Round Lake, Round Lake.....	400
Brackin's pond (C).....	100	Georgia:	
Mathis's pond.....	150	Altenhurst, Terrell's pond.....	400
Inverness, Pasture Pond.....	200	Americus, Mill Pond.....	400
Jasper, Cane Creek.....	1,000	Athens, Water Oak Pond.....	250
Lefloatchee, Payne's pond.....	300	Atlanta, McClelland's pond.....	350
Lineville, Lake Mary Scott.....	500	Augusta, Hagler Pond.....	400
Lineville Lake.....	350	Hammond Creek.....	1,250
Moon's pond (A).....	150	Baconton, Bacon's pond.....	200
Moon's pond (B).....	100	Bainbridge, Callahan Mill Pond.....	300
Luverne, Beall's lake.....	200	Deep Water Pond.....	300
Benbow's pond.....	200	Four Mile Pond.....	400
Howard's pond.....	100	Belair, Green Garden Pond.....	200
Madison, Lily Flag Pond.....	300	Box Springs, King Mill Pond.....	300
Marion, Jones Pond.....	100	Bullochville, Waddell's pond.....	200
Montgomery, Line Creek.....	400	Walden's pond (A).....	200
Olive Lake.....	400	Walden's pond (B).....	200
Munford, Ossco Pond.....	100	Walden's pond (C).....	200
Notasulga, Vaughan Mill Pond.....	825	Chipley, Maple Grove Pond.....	100
Oneonta, Wilemon's pond.....	100	Cisco, Cockburn's pond.....	150
Opelika, Ingram's mill pond.....	300	Lake View.....	150
Roaring Springs Pond.....	300	Columbus, Ram Pond.....	150
Opp, Shady Pond.....	100	Cordele, Ray's pond.....	1,100
Peachburg, Weem's pond.....	200	Dalton, Gossage's pond.....	150
Pell City, Cornett's pond.....	200	McLellan's pond.....	150
Petrey, Bodiford's pond.....	100	Danville, Champion's pond.....	200
Spradley's pond.....	200	Decatur, Mill Pond.....	300
Plantersville, Jones's pond.....	200	Greenville, Terrell's pond.....	250
Prattville, Davis's pond.....	300	Hapeville, Appling's pond.....	200
Pyrton, Birchfield's pond.....	150	Holly Springs, Fowler's pond.....	150
Blackstock's pond.....	100	McWhiter's pond.....	100
Morrison's pond.....	100	Ideal, Cromer's pond.....	150
Ramer, Boothe's pond.....	200	Jefferson, Head's pond.....	100
Riderville, Price-Rider Pond.....	300	Jimps, Wilson's pond.....	400
Speigner, Morton Pond.....	950	Louisville, Smith Branch.....	100
Stevenson, Hackworth's pond.....	200	Lulaton, Satilla River.....	800
Talladega, Talladega Creek.....	400	Lumpkin, Fort's pond.....	200

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## SUNFISH—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, year- lings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, year- lings, and adults.
<b>Georgia—Continued.</b>		<b>Iowa—Continued.</b>	
McDonald, Satilla River.....	1,200	Numa, Norris's pond.....	400
McDonough, Lower Pond.....	200	Steamboat Rock, Iowa River.....	1,600
McIntyre, Holton's pond.....	200	Williamsburg, Pilot Grove Pond.....	200
Price's pond.....	200	<b>Kansas:</b>	
Macon, Sherwood Creek.....	150	Effingham, Cook's pond.....	200
Martin, Dean's pond.....	100	Kincaid, Blue Grass Lake.....	200
Matthews, Pennington's pond.....	400	Sanders's pond.....	200
Melदान, Mossy Creek.....	500	Olathe, Hoff's lake.....	300
Mitchell, Kitchens's pond.....	600	Scipio, Richmond Pond.....	500
Monroe, Cochran pond.....	100	<b>Kentucky:</b>	
Oakwood, Walnut Creek Pond.....	200	Allenville, Donaldson's pond.....	300
Preston, Nicholson's pond.....	400	Mallory's pond.....	300
Shellman, Robinson's pond.....	200	Riley's pond.....	200
Smyrna, Akin's pond.....	150	Berea, Silver Creek, Brushy Fork.....	400
Stone Mountain, McCurdy's pond.....	300	Silver Creek, Upper.....	400
Summerville, Montgomery Mill Pond.....	550	Booker, Smith's pond.....	300
Summit, Johnson's pond.....	300	Campbellsville, Speer's pond.....	150
Suwannee, Jay's pond.....	50	Carrollton, Grobmyer's pond.....	150
Swainsboro, Kea's pond.....	400	Corydon, Horse Lot Pond.....	100
Summer Place Pond.....	300	Crestwood, Brewer's pond.....	150
Talbotton, Spear's pond.....	100	Danville, Bright's pond.....	300
Tallulah Falls, Tallulah Lake.....	600	Ekron, Bluegrass Pond.....	200
Thomasville, Smith-Moreland Pond.....	200	Maggies Lake.....	200
Tifton, Lula Lake.....	300	Zack Pond.....	200
Whitley's pond.....	400	Elizabethtown, Breeden's pond.....	300
Toccoa, Soapstone Lake.....	150	Erlanger, Codey's pond.....	150
Unadilla, Duncan's pond.....	200	Frankfort, Reformatory Pond.....	200
Valdosta, Gorton's pond.....	400	Glasgow, Beaver Creek.....	100
Vidette, Robinson's pond.....	200	Hollow Pond.....	100
Walls Crossing, Snider's pond.....	150	Greenup, Buffalo Creek.....	80
Washington, Little River.....	1,200	Tygart River.....	160
Ravenwood Pond.....	150	Greenville, Coomb's pond.....	200
Watkinsville, Oconee River.....	300	Helechawa, Red River.....	300
Weston, Spann Mill Pond.....	300	Henderson, Fruitland Pond.....	100
Whigham, Ochlocknee River.....	750	Hopkinsville, Little River, Sinking Fork.....	100
Winchester, Felton Mill Pond.....	300	L. & E. Junction, Rayborn's pond (A).....	200
<b>Illinois:</b>		Rayborn's pond (B).....	200
Mayfair, Udally's pond.....	100	Maceo, Hawes's pond.....	200
Meredosa, Illinois River.....	b 108,930	McKinney, Milling Company Pond.....	150
Meredosa Bay.....	b 350	McNary, Hahn's pond.....	200
Napierville, DuPage River.....	775	Maysville, Ohio River.....	1,200
Pittsfield, Matthew's pond.....	100	Mount Sterling, Cockrell's pond.....	100
<b>Indiana:</b>		Jeffrie's pond.....	200
Anderson, Stillwell's pond.....	200	Prewitt Pond.....	150
Wildwood Pond.....	400	Ratliff's pond.....	200
Bloomington, Bean Blossom Creek.....	600	Mount Vernon, Maret's pond.....	100
Bluffton, Gravel Pit Pond.....	200	Nebo, Woehler's pond.....	100
Bryant, Ligger's pond.....	200	Nicholasville, Smither's pond.....	100
Dubois, Sendelweck's pond.....	200	Nolin, Black Rock Pond.....	100
Frankfort, Shoemaker Lake, East.....	200	Home Pond.....	100
Gilman, Cherry Pond.....	200	Owensboro, Meadow Pond.....	100
Indianapolis, Fall Creek.....	600	Rocky Hill Station, Hudson Creek.....	200
Lippus Pond.....	200	Rowletts, Davis's pond.....	200
Middlebury, Stone Lake.....	400	Shelbyville, Undulata Lake.....	150
Muncie, Drumm's pond.....	200	Silver Creek, Paint Lick Creek.....	300
Pendleton, McCarty's pond.....	200	Thomson, Eubank's pond.....	100
Plymouth, Dixon Lake.....	400	Water Valley, Lone Oak Pond.....	100
Richmond, Morton Lake.....	400	Winchester, Red Cross Pond.....	200
Ridgeville, Lake Pequannaha.....	200	<b>Louisiana:</b>	
Scottsburg, Iola Lake.....	200	Chatham, Smart's pond.....	*15,000
Tangier, Moore's pond.....	200	Dodson, Stovall's pond.....	*9,000
Tipton, Duncan's pond.....	200	Elmore, Mount Zion Pond.....	*9,000
Twelve Mile, Hilda Lake.....	200	New Iberia, Dubois's pond.....	20
Van Bruen, Crestvona Pond.....	200	Wilson, Thompson's pond.....	300
Warren, Salamonina River.....	400	<b>Maryland:</b>	
<b>Iowa:</b>		College Park, Experiment Station Pond.....	150
Bellevue, Mississippi River.....	b 180,800	Hagerstown, Antietam Creek.....	450
Davenport, Vanderveer Park Lake.....	400	Conococheague Creek.....	450
Eldora, Iowa River.....	1,400	Ijamsville, Willow Pond.....	150
Lime Springs, Upper Iowa River.....	4,500		
Manchester, Maquoketa River.....	15,350		
North McGregor, Mississippi River.....	b 265,000		

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.<sup>b</sup> Rescued from overflowed lands and restored to original water.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## SUNFISH—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, year- lings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, year- lings, and adults.
<b>Michigan:</b>		<b>Mississippi—Continued.</b>	
Battle Creek, Lake Goguae.....	125	Stringer, Knight's pond.....	200
Holly, Burns Lake.....	75	Summer, Fergusson's pond.....	300
Jackson, Vandercook Lake.....	75	Sumrall, Miller's pond.....	200
Wolf Lake.....	125	Tomsuba, Page's pond.....	150
Montgomery, Long Lake.....	75	Tupelo, Amity Pond.....	200
Newaygo, Pickerel Lake.....	600	Sander's pond.....	150
Otia, Blue Lake.....	600	Shumpert's pond.....	200
Rose Centre, Spring Lake.....	25	Wheeler Pond.....	200
White Cloud, Lost Lake.....	1,200	Van Vleet, Willow Pond.....	200
Williams, Wolf Lake.....	75	Water Valley, Enderlin's pond.....	200
<b>Minnesota:</b>		West Point, Brady Pond.....	200
Homer, Mississippi River.....	b 599,461	Yazoo City, Williams Pond.....	800
Lanesboro, Root River.....	800	<b>Missouri:</b>	
Root River, North Branch.....	800	Blackburn, Pecan Grove Pond.....	200
<b>Mississippi:</b>		Bucklin, Chariton River, Mussell Fork.....	1,200
Aberdeen, Blue Lake.....	200	Calhoun, Butler Place Pond.....	400
Carter Pond.....	300	Centralia, Bluegrass Pond.....	100
Cribbs Pond.....	200	De Soto, Cape's pond.....	200
Cypress Pond.....	200	Everton, Meierhoff's pond.....	150
Goose Lake.....	200	Excelsior, Henry East Pond.....	200
Hickon Lake.....	300	Henry Northeast Pond.....	200
Amory, Armstrong's pond.....	200	Firma, Barrett Lake.....	1,000
Artesia, Brothers Pond.....	100	Hardland, Prairie View Pond.....	150
Bay St. Louis, Nicoise Pond.....	100	Kirksville, Moots's pond.....	300
Blue Mountain, Sumrall's pond.....	300	Lawson, Elm Grove Pond.....	200
Booneville, Smith Pond.....	400	Mansfield, Lake Crystal.....	600
Carriere, Breland's pond.....	100	Palmer Pond.....	150
Centerville, Cox's lake.....	400	Monet, Cundet's pond.....	495
Clinton, Johnston's pond.....	300	Norwood, Farm Pond.....	150
Corinth, Miller's pond.....	400	Palmyra, Bay de Charles.....	600
Shadburn's pond.....	150	Pomona, Lake Pippin.....	150
Derma, Hardin's pond.....	300	Potosi, Quaker Springs Pond.....	100
Egypt, Hammond's pond.....	300	Purcell, Bradford's pond.....	200
Fayette, McNair's pond.....	300	Rolla, Frisco Lake.....	4,000
Forest, Riser's pond.....	150	St. Charles, Passell's pond.....	200
Gloucester, Day's pond.....	200	Savannah, McFadden's pond.....	450
Dye Pond.....	200	Sedalia, State Fair Pond.....	100
McGehee's pond.....	200	Wayland, Johnson's pond.....	200
Robinson Pond.....	200	Windsor, Johnson's pond.....	400
Hazelhurst, Ranch Pond.....	200	<b>Montana:</b>	
Hickory, Walker's pond.....	300	Forsyth, Crockett Lake.....	200
Jackson, Lake von Leotzen.....	300	Yellowstone River.....	525
Learned, Osborn's pond.....	300	Glendive, Yellowstone River.....	250
Liberty, Brueck's pond.....	200	Miles City, Yellowstone River.....	250
Louisville, Brickyard Pond.....	300	<b>Nebraska:</b>	
Carter Pond.....	200	Arnold, Cass's pond.....	150
Clark Pond.....	200	Hardy, Rainey Pond.....	100
Club Pond.....	450	New Hampshire: Canaan, Spectacle Pond.....	200
Storer's pond.....	200	<b>New Jersey:</b>	
Lyman, Foley Branch Lake.....	150	Asbury Pary, Wesley Lake.....	600
Macon, Scales's lake.....	400	Piccatinney, Piccatinney Lake.....	600
Meridian, Queen City Pond.....	400	<b>New Mexico:</b>	
Mize, Bryant's pond.....	200	Albuquerque, Beckham's pond.....	50
McAlpin's pond.....	150	Buchanan, Cooley's pond.....	50
Mount Olive, Caraway's pond.....	200	Carlsbad, Black River.....	50
Penn's pond.....	150	Seaton's pond.....	50
Neshoba, Hillman's pond.....	200	Willis's pond.....	50
Olive Branch, Elder's pond.....	200	Cimarron, W. S. Lake.....	150
Philadelphia, Cole's pond.....	200	Clayton, Duren Creek.....	200
Hester's pond (A).....	300	Deming, Bauman's pond.....	50
Hester's pond (B).....	300	Des Moines, Spring Hill Pond.....	50
Sallis, Temple's pond.....	200	Dulce, Dulce Lake.....	50
Shuqualak, Bell's lake.....	200	Estancia, Sherwood's pond.....	50
McNee's pond.....	200	Walker's pond.....	50
Maury Pond.....	200	Kenna, Cooper's pond.....	50
Minor Pond.....	200	Savage's pond.....	50
River Lake.....	200	Las Vegas, Chupainas Pond.....	50
Vickers Lake.....	200	Lucia, McGillivray's pond.....	50
Willow Lake.....	200	Montoya, Twine Mill Lake.....	50
Starkville, Gamble's pond.....	200	Mountainair, Arroya de la Cienega.....	50
Hogan Lake.....	200		
Templeton's pond.....	200		

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.<sup>b</sup> Rescued from overflowed lands and restored to original waters.



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## SUNFISH—Continued.

Disposition.	Fry,* finger- lings, year- lings, and adults.	Disposition.	Fry,* finger- lings, year- lings, and adults.
<b>New Mexico—Continued.</b>		<b>Oklahoma:</b>	
Romero, Vernon's pond.....	50	Ada, Forest Grove Lake.....	3,000
Roswell, North Bottomless Lake.....	100	Ardmore, Chickasaw Lake.....	100
Taiban, Jeter's pond.....	50	Harrel's ponds.....	400
Klutts's pond.....	50	Plainview Pond.....	2,000
Muller's pond.....	50	Woods Lake.....	6,000
Sherman's pond.....	50	Asher, Knight's pond.....	3,000
Wise's pond.....	50	Blanchard, Robinson's pond.....	400
<b>New York:</b>		Buffington, Illinois River.....	16,000
Addison, Canisteo River.....	400	Canute, Young's pond.....	50
Baldwin, Clow Lake.....	200	Cherokee, Beadman Lake.....	100
Binghamton, Fiala's pond.....	200	Foss, Augustine Pond.....	400
Boston, Boston Hill Pond.....	200	Hallett, Cassidy's pond.....	4,000
Chappaqua, Kent's pond.....	200	Hennessey, Gritz's pond.....	400
Congers, New Lake.....	400	Hollister, Stephen's pond.....	300
Fishkill, Lake Garda.....	200	Isabella, Laubach's pond.....	300
Highland, Central Lake.....	200	Konawa, Fiddler's pond.....	3,000
White Plains, Rathbone's pond.....	200	McComb, Spray Pond (A).....	3,000
<b>North Carolina:</b>		Spray Pond (B).....	3,000
Apex, Seagrove's pond.....	100	Madill, Willow Lake.....	4,500
Atkinson, Hawes's pond.....	200	Manitou, Elmwood Pond.....	200
Cofield, Wiley Pond.....	200	Marlow, Rubendall's pond.....	900
Concord, Irish Buffalo Creek.....	550	Mill Creek, Pennington River.....	4,000
Faison, Goshen Creek.....	1,200	Mooreland, Borchardt's pond.....	50
Four Oaks, Flowers's pond.....	200	Lakeside Pond.....	50
Franklinton, Williams's pond.....	400	Willow Lake.....	50
Garland, Carter's pond.....	150	Noble, Chickasaw Lakes.....	10,500
Gold Hill, Morgan's pond.....	150	North Coalgate, Gills Lake.....	8,000
Poole's pond.....	150	Okemah, Riley's pond.....	4,500
Gulf, Caroline Pond.....	100	Willow Grove Pond.....	4,500
Hamlet, Gibson's pond.....	200	Pauls Valley, Mankins Lake.....	6,000
Henderson, Parker's pond.....	200	Perry, Duncan's pond.....	3,000
Hickory, Rocket's pond.....	100	Quinlan, Wylie's lake.....	50
Huntersville, Wilson's pond.....	100	Reeding, Triplett's pond.....	800
Kings Mountain, Sevier Mills Pond.....	100	Seminole, Dolen's pond.....	400
Kinston, Gray's pond.....	400	Snyder, Stradley's pond.....	150
Lumberton, McMillan Pond.....	450	Woodward, Russau's pond.....	50
McCullers, Franks's pond.....	150	<b>Pennsylvania:</b>	
Marshall, Walnut Creek.....	300	Chambersburg, Conococheague Creek.....	200
Maysville, White Oak River.....	600	Coleman, Stony Creek River, Upper.....	1,200
Mineral Springs, Long's pond.....	150	Denver, Good's pond.....	300
Rorie's pond.....	150	Gap, Salesbury Lake.....	300
Monroe, Baucom's pond.....	100	Greensburg, Beason Run Pond.....	300
Mooreville, Community Pond.....	300	Holden, Moore's pond.....	200
Morven, Cox's pond.....	300	Jenkintown, Madiera's pond.....	300
McLauren's pond.....	200	Lancaster, Kukle Lake.....	600
Watts's pond.....	200	Reedys Lake.....	300
Murphy, Valley River Pond.....	200	Lansdale, Spring Lakes.....	300
Pee Dee, Blewett Falls Pond.....	300	Mill Hall, Brungard Pond.....	200
Rockfish, Jumping Gully Pond.....	300	Monocacy, Lewis's pond.....	300
Rockingham, Falling Creek Pond.....	400	Murraysville, Jankowiak's pond.....	300
Hitchcock Creek.....	400	New Florence, Hendrix Creek, Lower.....	600
Liles's pond.....	400	Phoenixville, French Creek.....	600
Statesville, Steele's pond.....	50	Reading, Alleghany River.....	300
Stovall, Gregory's pond.....	400	Antietam Creek.....	300
Wilson, Tribo Flowers Pond.....	200	Cacoosing Creek.....	300
<b>North Dakota: Devils Lake, Devils Lake</b>	<b>800</b>	Licking Creek.....	300
<b>Ohio:</b>		Manatawny Creek.....	300
Akron, Brady Lake.....	280	Pine Creek.....	300
Fritch Lake.....	280	Sacony Creek.....	300
Nesmith Lake.....	280	Spring Creek.....	300
New Reservoir.....	280	Swamp Creek.....	300
Rex Lake.....	500	Teagley Lake.....	600
Twin Lakes.....	280	Tulpehocken Creek.....	300
Bellville, Gattons Lakes.....	225	Wyomissing Creek.....	300
Geauga Lake, Geauga Lake.....	450	Waterville, Little Pine Creek.....	200
Lima, McCullough Lake (A).....	400	Wilcox, Brennen Pond.....	225
McCullough Lake (B).....	400	Shultz Pond.....	225
Malvern, Big Sandy Creek.....	280	<b>Porto Rico: San Juan, Carite Reservoir.....</b>	<b>1,500</b>
Newark, Buckeye Lake.....	275	<b>South Carolina:</b>	
Portsmouth, Little Scioto River.....	100	Abbeville, Calhoun Creek.....	600
St. Clairsville, Cloister Pond.....	400	City Waterworks Pond.....	200
St. Marys, Lake St. Mary.....	800	Gambrell's pond.....	200
Sardinia, Druhot's pond.....	100	Long Cane Creek.....	600

\* Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## SUNFISH—Continued.

Disposition.	Fry, <sup>a</sup> finger- lings, year- lings, and adults.	Disposition.	Fry, <sup>a</sup> finger- lings, year- lings, and adults.
South Carolina—Continued.		Texas:	
Abbeville, Perrin's pond.....	100	Abernathy, Oliver's pond.....	75
Allendale, Wood Place Pond.....	200	Alanreed, Brown's pond.....	75
Anderson, McKinney's lake.....	1,000	Alba, Patten's pond.....	150
Bennettsville, Stillwater Pond.....	200	Archer City, Windthorst Pond.....	125
Cheraw, Hunt Pond.....	200	Arp, Bates's pond.....	150
Whites Creek.....	400	Asherton, Finley's lake.....	100
Conway, Bourne's pond.....	500	Atlanta, Cameron's pond.....	150
Due West, Ashley's pond.....	150	Bastrop, Country Club Lake.....	150
Effingham, Lawrence's pond.....	200	Bedias, Lake Grove.....	150
Estill, Hamilton Ridge Pond.....	100	Belew, Young's pond.....	250
Florence, Black Creek.....	1,200	Big Sandy, Mayfield's pond.....	150
Gilmore Mill Pond.....	400	Brenham, Club Lake.....	200
Haynsworth's pond.....	150	Brownwood, Ratliff's pond.....	150
Fort Motte, Burgess's pond.....	400	Bryson, Lipscomb's pond.....	75
Greenville, City Quarry Pond.....	150	Burlington, Brod's pond.....	100
Hartsville, Boggy Pond.....	150	Caldwell, Haddoz Pond.....	200
McIntosh Mill Pond.....	200	Hitchcock's pond.....	200
Heath Springs, Moore's pond.....	150	Oliver's lake.....	200
Hodges, Nickles's pond.....	200	Canyon, Palo Duro Creek.....	300
Honea Path, Simmons's pond.....	100	Carbon, Murphy's pond.....	50
Jefferson, Bird's pond.....	100	Carlton, Dixie Pond.....	100
Lamar, White's pond.....	200	Cedric, Cowles's pond.....	100
Langley, Langley Pond.....	200	Center, Oak Lawn Lake.....	150
Laurens, Little River, Balls Fork.....	200	Wood Lake.....	200
McBee, Sowell's pond.....	200	Cheneyboro, Cheney's pond.....	100
North, Johnson's pond.....	200	Chico, Booth's pond.....	75
Orangeburg, Sims's pond.....	200	Clifton, Riverside Garden Pond.....	50
Smaoks Pond.....	200	Clyde, Ferguson's pond.....	75
Pelion, Pelion Pond.....	200	Coahoma, Winston Pond.....	75
Piedmont, McMahan's pond.....	200	Columbus, Wooten Pond.....	150
Rock Hill, Arcade Pond.....	200	Cooper, De Vaney's pond.....	100
St. Matthews, Corcor Swamp Pond.....	200	Corsicana, Fish Pond.....	150
Neale's pond.....	200	Gentsch's pond.....	75
St. Stephens, Tom Bottom Pond.....	400	Magnolia Pond.....	150
Society Hill, Evans Mill Pond.....	400	Crosbyton, White River.....	500
Springfield, Electric Power Pond.....	300	Cross Plains, Cross Cut Reservoir.....	150
Summersville, Winningham Pond.....	300	Everett's pond.....	100
Sumter, Bethel Pond.....	200	Cuero, Tully's pond.....	100
McCutcheon Pond.....	200	Dallas, Gatman's pond.....	200
Osteen's pond.....	200	Kidd Spring Pond.....	400
Taylor, Beaverdam Pond.....	100	Detroit, Gray Lake.....	250
Trenton, Hatcher Pond.....	200	Dumont, East Bank Lake.....	125
Rock Pond.....	100	Edgewood, Melton Flanagan Lake.....	125
Sease's pond.....	200	Ennis, Moore Lake.....	75
Wedgefield, Sherwood Pond.....	100	Willow Pond.....	75
Winnboro, Jackson Creek Pond.....	100	Falfurrias, Margarita Lake.....	100
South Dakota: Winner, Lake Westonka.....	250	Farwell, Goodenough's pond.....	100
Tennessee:		Withers's pond.....	75
Arthur, Lambirt's pond.....	300	Fort Worth, Lake Como.....	100
Atoka, Hill and Vale Pond.....	200	Lake Worth.....	200
Bristol, Large's pond.....	150	Silver Creek.....	200
Wolford's pond.....	100	Gainesville, Priddy's lake.....	50
Capleville, Ellis's pond.....	200	Gary, Graves-Daniel Pond.....	150
Cedar Hill, Red River, Sulphur Fork.....	10,000	Williams's pond.....	150
Chatanooga, Chattanooga Creek.....	625	Gilmer, Lake Oakland.....	200
Freeman's pond.....	400	Glazier, Locust Grove Pond.....	75
Middle Creek.....	400	Gonzales, Lewis's pond.....	100
Cleveland, Springdale Pond.....	425	Steen's pond.....	100
Crab Orchard, Wheeler's pond.....	200	Grand Saline, Carrington Lake.....	125
Greeneville, Doty's pond.....	150	Greenbrier, Butler Lake.....	200
Henning, Currie's pond.....	200	Hamilton, Rea's pond.....	100
Hunter, Stony Creek.....	1,000	Happy, Lake View.....	75
Jackson, Simmons's pond.....	200	Hartley, Shady Pond.....	150
Lenoir City, Alexander Lake.....	600	Henderson, Jones's pond.....	75
Madison, Gee's pond.....	4,000	Long Lake.....	50
Maryville, Allen's pond.....	150	Snider Pond.....	75
Mason, Boyd's pond.....	200	Willow Pond.....	75
Hamblet's pond.....	400	Yandle's pond.....	75
Old Whitley Pond.....	200	Hereford, Roberson's pond.....	75
Montvale, Carpenter's pond.....	150	Hondo, Moss Pond.....	60
Murfreesboro, Downing's pond.....	200	Honey Grove, Carter's pond.....	125
Prospect, Bester's pond.....	25	Hubbard, Swader's pond.....	200
Stanton, Morris's pond.....	4,000	Huntington, Wood's pond.....	75
Wartrace, Duck River, Garrison Fork.....	500	Itasca, Mitchell's lake.....	50

<sup>a</sup> Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## SUNFISH—Continued.

Disposition.	Fry,* finger- lings, year- lings, and adults.	Disposition.	Fry,* finger- lings, year- lings, and adults.
Texas—Continued.		Texas—Continued.	
Jacksboro, Blue Pond.....	100	Sherman, Country Club Lake.....	250
Jacksonville, Alexander's pond.....	200	Sipe Springs, Leonard's lake.....	150
Josephine, Davis's pond.....	100	Somerville, Lang's pond.....	150
Jourdanton, Hagelstein's pond.....	50	Stanton, Henson's pond.....	75
Kaufman, Cottonwood Pond.....	325	Sulphur Springs, Taylor's pond.....	200
Kerens, Massey's pond.....	100	Wilder's pond.....	100
Kress, Groff's pond.....	75	Tahoka, Lockhart's pond.....	100
Lamesa, McCarty's pond.....	100	Taylor, Schwenker's pond.....	100
Sandy Shoal Lake.....	100	Texarkana, Southside Pond.....	100
Lindale, Hazel Lake.....	150	Thornton, Adair's pond.....	75
Lockney, Curlew Pond.....	75	Tulia, Shady Nook Pond.....	150
Longview, Campbell-Morgan Pond.....	300	Vega, Bluewater Hole Pond.....	100
Catterton's pond.....	300	Vernon, Spring Creek.....	300
Teague's pond.....	200	Washington, Hibbett's pond.....	150
Lorenzo, Hoops's pond.....	100	Wellborn, Barron's pond.....	150
Lovelady, Pecan Hill Pond.....	150	Wichita Falls, Archer Lake.....	300
McKinney, Perkins's pond.....	100	Wills Point, Black Jack Lake.....	125
Marathon, Santiago Ponds.....	250	Dicks Lake.....	250
Marion, Weyel's pond.....	150	Ditch Lake.....	125
Mart, Tidwell's pond.....	150	East Wills Point Pond.....	125
Matagorda, Norton's pond.....	75	Lake Allen.....	125
Meridian, Meadows Lake.....	50	Lake Bruce.....	125
Miami, Dial Lake.....	150	Lake Charles.....	125
Mineola, Glade Creek.....	300	Lake Gilchrist.....	125
Kendrick's pond.....	200	Lake Marshall.....	125
Lloyd's pond.....	200	Lake Pratt.....	125
Mineola Club Lake.....	200	Lake Province.....	125
Pollard's pond.....	150	Lake Sigmond.....	125
Sikes's pond.....	150	Lake Wilson.....	125
Mineral Wells, Wynne Mountain Lake.....	75	Palmer Lake.....	125
Mount Calm, Nelson Lake.....	100	Uta Pabst Lake.....	125
Mount Vernon, Bryant's pond.....	75	Van Zandt Lake.....	250
Muleshoe, Elrod's pond.....	175	Wortham, Hackney's pond.....	150
Nacogdoches, Nacogdoches Creek.....	300	Virginia:	
Naples, Sycamore Pond.....	150	Battery Park, Rainbow Farm Pond.....	200
Navasota, Woodlawn Pond.....	150	Beaver Dam, Osier Swamp Pond.....	300
New Waverly, Lewis's lake.....	150	Coan, Benfirmed Pond.....	400
Palacios, Campbell's pond.....	75	Columbia, Baker's pond.....	200
Paris, Lake View.....	125	Gretna, Whitethorn Creek.....	150
Pine Hill, Farley's pond.....	75	Hewlett, Trevillian's pond.....	200
Pittsburg, Bermuda Lake.....	150	Keysville, Red Hill Pond.....	40
Holt's lake.....	150	Pamplin, Horse Pen Pond.....	200
Hughes Lake.....	150	Plains, Huntland Pond.....	40
Roark's pond.....	100	Shackleford, Rays Neck Mill Pond.....	200
Willow Pond.....	150	Suffolk, Norfleet Pond.....	500
Plainview, Abney's pond.....	75	Wise, Hamilton's pond.....	200
Allen's pond.....	75	West Virginia:	
Helen-Temple Pond.....	75	Spencer, Hospital Lake.....	200
Lake Plainview.....	300	Waiteville, Hinchie Pond.....	240
Post, Crane's pond.....	75	Wisconsin:	
Quinlan, Wooldridge's pond.....	150	Frederic, Coon Lake.....	200
Ridgeway, Hill's pond.....	100	Galesville, Lake Marinuka.....	600
Riviera, Graham's pond.....	100	La Crosse, Mississippi River.....	b 136,000
Rails, White-Robertson Lake.....	100	Rosholt, Trilweiler Lake.....	800
Roxton, Bywater's pond.....	100	South Germantown, Quarry Ponds.....	1,600
San Marcos, Burger Pond.....	150	West Bend, Lily Lake.....	2,000
Santo, Live Oak Pond.....	75		
Schulenburg, Russek's pond.....	100		
Scurry, Murdock's pond.....	150		
Nash's pond.....	100		
		Total b.....	{ *33,000 1,635,881

a Fry indicated by an asterisk, thus (\*); all others are fingerlings, yearlings, and adults.

b Lost in transit, 4,620 fingerlings.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## PIKE AND PICKEREL.

Disposition.	Finger- lings, yearlings, and adults.	Disposition.	Finger- lings, yearlings, and adults.
<b>Illinois:</b>		<b>Montana:</b>	
Belvidere, Kishwaukee River.....	100	Forsythe, Yellowstone River.....	75
Freeport, Pecatonica River.....	360	Glendive, Yellowstone River.....	458
Polo, Pine Creek.....	100	Miles City, Yellowstone River.....	32
<b>Iowa:</b>		Wisconsin: La Crosse, Mississippi River.....	a 5,800
Bellevue, Mississippi River.....	a 18,400		
Manchester, Maquoketa River.....	479	Total.....	43,436
North McGregor, Mississippi River.....	a 550		
Minnesota: Homer, Mississippi River.....	a 17,082		

a Rescued from overflowed lands and restored to original waters.

## PIKE PERCH.

Disposition.	Eggs, fry, and yearlings. <sup>a</sup>	Disposition.	Eggs, fry, and yearlings. <sup>a</sup>
<b>Connecticut:</b>		<b>Michigan—Continued.</b>	
Bristol, Pine Lake.....	300,000	Oscoda, Allen Lake.....	500,000
Taconic, Long Pond.....	300,000	Cook Pond.....	600,000
<b>Illinois:</b>		Duell Lake.....	400,000
Du Quoin, Gregory's pond.....	200,000	Van Etan Lake.....	800,000
Hallidayboro, Hallidayboro Lake.....	700,000	Otia, Benton Lake.....	300,000
Meredosia, Meredosia Bay.....	50,000	Topinabee, Mullett Lake.....	1,000,000
Sandwich, Fox River.....	700,000	Wooster, Crystal Lake.....	400,000
Spring Grove, State fish commis- sion.....	*20,000,000	Yorkville, Gull Lake.....	800,000
<b>Indiana:</b>		<b>Minnesota:</b>	
Columbia City, State fish com- mission.....	*15,000,000	Carlton, Chub Lake.....	400,000
Columbus, White River, East Fork.....	*2,000,000	Cromwell, Island Lake.....	400,000
Corunna, Indian Lake.....	300,000	Duluth, Horse Shoe Lake.....	100,000
Culver, Lake Maxinkuckee.....	700,000	Pike Lake.....	100,000
Indianapolis, White River.....	*2,000,000	Schumultz Lake.....	100,000
Lafayette, Wabash River.....	800,000	Faribault, Shields Lake.....	225,000
LaGrange, Pigeon Lake.....	400,000	Homer, Mississippi River.....	12,660
Ligonier, Diamond Lake.....	400,000	Lanesboro, Root River.....	200,000
Logansport, Wabash River.....	600,000	Root River, North Branch.....	200,000
Mentone, Tippecanoe River.....	500,000	Mazeppa, Lake Mazeppa.....	225,000
Shelbyville, Flat Rock River.....	600,000	Mentor, Maple Lake.....	400,000
Warsaw, Winona Lake.....	600,000	Orchard Lake, Lake Avelon.....	200,000
<b>Iowa:</b>		Robinsdale, Twin Lake.....	200,000
Mason City, Lime Creek.....	300,000	Sturgeon Lake, Sturgeon Lake.....	400,000
Spirit Lake, State fish commis- sion.....	*25,000,000	<b>Nebraska: Gretna, State fish com- mission.....</b>	*1,500,000
Steamboat Rock, Iowa River.....	800,000	<b>New Hampshire:</b>	
<b>Kentucky: Lexington, State Fish Commission.....</b>	9,600,000	Concord, Contoocook River.....	400,000
<b>Maryland: Tolchester, Horrington Pond.....</b>	200,000	Littleton, Forest Lake.....	400,000
<b>Massachusetts:</b>		<b>New Jersey:</b>	
Palmer, State fish commission.....	*25,000,000	Boonton, Capstick Lake.....	300,000
Springfield, Turners Park Pond.....	300,000	Rockaway, Cedar Lake.....	300,000
<b>Michigan:</b>		<b>New York:</b>	
Allenville, Brevort Lake.....	500,000	Ausable Forks, Butternut Pond.....	200,000
Alpena, Long Lake.....	800,000	Furnis Lake.....	200,000
Baraga, Sturgeon River.....	100,000	Silver Lake.....	200,000
Bay City, Saginaw Bay.....	1,500,000	Taylor Pond.....	200,000
Byron, McKane Lake.....	500,000	Bath, Lake Salubria.....	400,000
Caseville, Saginaw Bay.....	3,000,000	Canisteo, Demon Pond.....	400,000
Charlevoix, Susan Lake.....	500,000	Cape Vincent, St. Lawrence River.....	13,500,000
Detroit, State fish commission.....	*26,235,000	Evans Mills, Indian River.....	500,000
Floodwood, Edgar Lake.....	150,000	Fishkill, Bennywater Pond.....	300,000
Grawn, Duck Lake.....	600,000	Brinkerhoff Pond.....	300,000
Holly, Long Lake.....	400,000	Fullers Bay, Lake Ontario.....	5,000,000
Houghton, Poppy Creek.....	150,000	Gouverneur, Grass Lake.....	500,000
Lake Ann, Lake View.....	500,000	Pleasant Lake.....	800,000
Ontonagon, Carp Lake.....	300,000	Grass Bay, St. Lawrence River.....	10,000,000
		Highland Falls, Long Pond.....	200,000
		Roe Lake.....	200,000
		Niagara Falls, Lake Ontario.....	1,000,000
		Niagara River, Upper.....	1,000,000

a Eggs are indicated by an asterisk, thus (\*); yearlings by a dagger, thus (†); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## PIKE PERCH—Continued.

Disposition.	Eggs, fry, and yearlings. <sup>a</sup>	Disposition.	Eggs, fry, and yearlings. <sup>a</sup>
<b>New York—Continued.</b>		<b>Vermont—Continued.</b>	
Ogdensburg, Oswegatchie River...	8,400,000	Morrisville, Big Pond.....	200,000
St. Lawrence River.....	3,600,000	Lake Lamoille.....	500,000
Portlandville, Goodyear Lake.....	1,000,000	North Ferrisburg, Lewis Creek.....	150,000
Redwood, Millsite Lake.....	800,000	Little Otter Creek.....	150,000
Riverside, Loon Lake.....	300,000	Pittsford, Sugar Hollow Pond.....	100,000
Mountain Spring Lake.....	150,000	Richmond, Hinesburg Pond.....	400,000
Schroon Lake.....	400,000	Rutland, Pine Hill Pond.....	100,000
Schroon River.....	200,000	Swanton, Lake Champlain.....	23,226,800
St. Johnsville, Stewarts Landing Creek.....	300,000	Vergennes, Otter Creek.....	250,000
Schenectady, Mohawk River.....	800,000	Wells River, Halls Pond.....	300,000
Whaley Lake, Whaley Lake.....	800,000	West Burke, Newark Pond.....	200,000
Wurtsboro, Masten Lake.....	200,000	Whitington, Sawdawa Lake.....	250,000
Yankee Lake.....	500,000	Wilmington, Lake Raponda.....	150,000
<b>North Dakota:</b>		West Virginia: Harrisville, Hughes River, North Fork.....	1,100,000
Binford, Red Willow Lake.....	300,000	<b>Wisconsin:</b>	
Devils Lake, Devils Lake.....	*3,000,000	Amery, Blake Lake.....	60,000
Pingree, Jim Lake.....	400,000	Antigo, Tyre Lake.....	120,000
St. Johns, State fish commission...	*6,000,000	Centuria, Deer Lake.....	120,000
<b>Ohio:</b>		Durand, Eau Galle Lake.....	150,000
Isle St. George, Lake Erie.....	10,000,000	Eau Galle River.....	150,000
Kellys Island, Lake Erie.....	10,000,000	Elkhart Lake, Crystal Lake.....	120,000
Lake View, Indian Lake.....	600,000	Elkhart Lake.....	120,000
Marblehead, Lake Erie.....	5,400,000	Elk Mound, Cedar Fall Lake.....	200,000
Middle Bass, Lake Erie.....	10,000,000	Fifield, Turner Lake.....	120,000
Millersburg, Kilbuck River.....	500,000	Fox Lake, Fox Lake.....	300,000
Port Clinton, Lake Erie.....	5,000,000	Frederic, Blom Lake.....	60,000
Put in Bay, Lake Erie.....	10,000,000	Hawkins, Gooseneck Lake.....	60,000
State fish commission.....	*68,425,000	Skinner Creek, South Fork.....	60,000
Woodfield, Crow Nest Creek.....	400,000	Hudson, Lake St. Croix.....	120,000
Zoar, Tuscarawas River.....	400,000	Independence, Bugle Lake.....	200,000
<b>Pennsylvania:</b>		Elk Lake.....	200,000
Denver, Coalico Creek.....	300,000	Ixonia, Rock River.....	600,000
Everett, Juniata River, Raystown Branch.....	500,000	Jamesville, Rock River.....	800,000
Huntingdon, Juniata River.....	500,000	Johnson Creek, Rock River.....	100,000
Juniata River, Raystown Branch Standing Stone Creek.....	500,000	Kilbourn, Parker Lake.....	240,000
Lake Carey, Lake Carey.....	600,000	Wisconsin River.....	240,000
Lancaster, Conestoga River.....	400,000	La Crosse, Black River.....	80,000
Lewistown Junction, Juniata River	400,000	Blacksnake Creek.....	80,000
Manns Choice, Juniata River, Raystown Branch.....	400,000	Broken Gun Creek.....	80,000
Shawnee Creek, Raystown Branch.....	400,000	Chamberlin Slough Pond.....	80,000
Sellersville, Perkiomen Creek, Northeast Branch.....	300,000	Clarks Lake.....	80,000
Shaws, French Creek.....	400,000	Dark Slough Creek.....	80,000
Union City, State fish commission.	*3,000,000	French Slough Creek.....	80,000
<b>South Dakota:</b>		Gibbs Chute Creek.....	80,000
Gary, Lake Cochrane.....	200,000	Hammond Chute Creek.....	80,000
Watertown, State fish commission.	*25,000,000	Jollivettes Bay.....	80,000
<b>Vermont:</b>		Jolyn Slough Creek.....	100,000
Barnet, Martins Pond.....	300,000	La Crosse River.....	79,000
Barre, Sabin Pond.....	400,000	Mississippi River.....	† 800
Barton, Crystal Lake.....	200,000	Nicolls Bay.....	79,000
Boltonville, Ticklenaked Pond.....	300,000	Rice Lake.....	79,000
Brandon, Lake Hortonia.....	250,000	Running Slough Creek.....	79,000
Burlington, Lake Champlain.....	23,526,480	Spring Slough Creek.....	79,000
Cambridge, Lamoille River.....	500,000	Swift Creek.....	79,000
Colchester, Colchester Pond.....	300,000	Wigwam Slough Creek.....	79,000
Danville, Ewells Pond.....	300,000	Zeisler Lake.....	47,000
East Fairfield, Metcalf Pond.....	300,000	Lyndhurst, Gardner Lake.....	60,000
Enosburg Falls, Lake Carmi.....	500,000	Schmidt Lake.....	60,000
Essex Junction, Great Power Pond	300,000	Mattoon, Bakers Lake.....	60,000
Fairlee, Lake Morey.....	500,000	Hutchins Lake.....	120,000
Ferrisburg, Little Otter Creek.....	100,000	Johnson Lake.....	60,000
Greensboro, Long Pond.....	400,000	Moose Lake.....	120,000
Groton, Lake Groton.....	300,000	Menomonie, Asylum Bend Lake.....	50,000
Hardwick, Greenwood Lake.....	500,000	Atlata Bay Lake.....	50,000
Hyde Park, Lake Eden.....	400,000	Bear Lake.....	50,000
South Pond.....	300,000	Black Lake.....	50,000
Inwood, Wardens Pond.....	300,000	Chippewa Lake.....	50,000
Milton, Lamoille River.....	750,000	Colfax Lake.....	50,000
Montpelier, Nelson Pond.....	300,000	Cut Off Lake.....	50,000
		Downsville Lake.....	50,000
		Dunnville Lakes.....	100,000
		Hunts Bay Lake.....	50,000
		Manleys Bend Lake.....	50,000
		New Haven Lake.....	50,000

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); yearlings by a dagger, thus (†); all others are fry.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## PIKE PERCH—Continued.

Disposition.	Eggs, fry, and yearlings. <sup>a</sup>	Disposition.	Eggs, fry, and yearlings. <sup>a</sup>
Wisconsin—Continued.		Wisconsin—Continued.	
Menomonie, Red Cedar River.....	50,000	Sparta, Rock Lake.....	120,000
Sand Lake.....	50,000	Three Lakes, Green Bass Lake.....	120,000
Yellow Banks Lake.....	50,000	Planting Ground Lake.....	60,000
Merrill, Lake Pesobic.....	120,000	Trempealeau, Second Lake.....	200,000
Lake View.....	120,000	Turtle Lake, Horseshoe Lake.....	200,000
Owen, Black River.....	180,000	Waupaca, Chain of Lakes.....	120,000
Popple River.....	300,000	Silver Lake.....	120,000
Pelican Lake, Pelican Lake.....	60,000	Townsend Lake.....	120,000
Pembine, Lindquist Lake.....	120,000		
Reedsburg, Baraboo River.....	120,000	Total <sup>b</sup> .....	{ * 222,160,000
Rhineland, Moen Lake.....	60,000		{ c 214,536,740
Sheboygan, Lake Ellan.....	120,000		

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); yearlings by a dagger, thus (†); all others are fry.<sup>b</sup> Lost in transit, 400,000 fry.<sup>c</sup> Includes 3,460 yearlings.

## YELLOW PERCH.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Connecticut: East Hampton, Pocotopaug Lake.....		450	Maryland—Continued.		
Delaware: Wilmington, Circle Pond.....		100	Elk River, Chesapeake Bay.....	2,000,000	
District of Columbia: Washington, Potomac River.....	1,000,000		Hagerstown, Conococheague Creek.....	500,000	
Illinois:			Havre de Grace, Elk River.....	10,000,000	
Freeport, Pecatonica River.....		1,000	Mill Creek.....	7,000,000	
Polo, Pine Creek.....		375	Piscataway Creek, Potomac River.....	12,440,000	
Meredosia, Meredosia Bay.....		<sup>b</sup> 500	Pommonkey Creek, Potomac River.....	9,100,000	
Rockford, Rock River.....		225	Swan Creek, Potomac River.....	7,918,000	
Indiana:			Swan Creek, Susquehanna River.....	11,900,000	
Columbus, East White River.....		400	Massachusetts:		
Flat Rock Creek.....		200	Greenfield, Connecticut River.....		340
Indianapolis, White River.....	*2,000,000		Old River Bed.....		200
Iowa:			Lee, Greenwater Pond.....	200,000	
Bellevue, Mississippi River.....		<sup>b</sup> 15,575	Laurel Lake.....	200,000	
Eldora, Iowa River.....		225	Lower Goose Pond.....	200,000	
Lime Springs, Upper Iowa River.....		800	Shaw Pond.....	200,000	
Manchester, Maquoketa River.....		150	Stockbridge Lake.....	200,000	
North McGregor, Mississippi River.....		<sup>b</sup> 30,600	Upper Goose Pond.....	200,000	
Shenandoah, Walnut Creek Pond.....		1,100	Palmer, State fish commission.....	*15,000,000	
Steamboat Rock, Iowa River.....		150	Michigan:		
Kentucky:			Bately, Woods Lake.....		300
Indian Fields, Lulbe-grud Creek.....		300	Greenville, Blue Lake.....		300
Mount Sterling, Cockrell's pond.....		100	Newaygo, Spring Creek.....		100
Johnson's pond.....		100	Rose Centre, Fish Lake.....		300
Maryland:			Minnesota:		
Accokeek Creek, Potomac River.....	19,948,000		H o m e r, Mississippi River.....	390,000	<sup>b</sup> 104,546
Broad Creek, Potomac River.....	15,300,000		Simpson, Root River, North Branch.....	300,000	
Chase, Dundee Creek.....		100	Missouri:		
			Mansfield, Lake Crystal.....		100
			Neosho, H e a r r a l l Branch.....		110
			Sloan Lake.....		100
			St. Louis, Poupenny Lake.....		375
			Montana:		
			Forsyth, Yellowstone River.....		200

<sup>a</sup> Eggs indicated by an asterisk, thus (\*); all others fry.<sup>b</sup> Rescued from overflowed lands and restored to original waters.

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## YELLOW PERCH—Continued.

Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.	Disposition.	Fry and eggs. <sup>a</sup>	Fingerlings, yearlings, and adults.
Montana—Continued.			Pennsylvania—Contd.		
Miles City, Yellowstone River.....		275	Williamsport, Loyalsock Creek.....		200
New Jersey:			Wysox, Susquehanna River.....		300
Hackettstown, State fish commission.....	*10,000,000	200	Texas: Denison, City Reservoir Lake.....		50
Millville, Union Lake.....			Vermont:		
New Mexico:			Barre, Sabin Pond.....	300,000	
Cimarron, Antelope Valley Lakes.....		600	Brandon, Lake Horton.....	500,000	
Dulce, Dulce Lake.....		100	East Wallingford, Patch Pond.....	400,000	
New York:			Spectacle Pond.....	300,000	
Cape Vincent, St. Lawrence River.....	13,600,000	600	Ely, Fairlee Lake.....		100
Fallsburgh, Alta Lake.....			Enosburg Falls, Lowle Pond.....	300,000	
Fishkill, Bennywater Pond.....		69	Florence, Otter Creek.....	500,000	
Brinkerhoff Pond.....		46	Greensboro Bend, Flagg Pond.....		100
New York, Aquarium.....	*500,000	600	Hardwick, Greenwood Lake.....	500,000	
Parish, Tutts Pond.....			Lyndonville, Crystal Lake.....	400,000	
Pine Bush, Paughcaughnaughtsinque Creek.....		600	Pasture Pond.....	500,000	
Wayland, Loon Lake.....		1,400	Montpelier, Curtis Pond.....	300,000	
Whaley Lake, Whaley Lake.....		450	Mount Holly, Jackson Pond.....	300,000	
North Carolina: Siler City, Edwards's pond.....		100	North Ferrisburg, Lewis Creek.....	400,000	
North Dakota:			Little Otter Creek.....	400,000	
Crete, Widmer's pond.....		200	Plainfield, Nelson Pond.....	400,000	
Devils Lake, Devils Lake.....		400	Rickers, Wells River Pond.....	400,000	
Ohio:			Salisbury, Otter Creek.....	500,000	
Lima, McBeth Lake (A).....		200	Vergennes, Otter Creek.....	500,000	
McBeth Lake (B).....		100	Virginia:		
New Berlin, Marchand's pond.....		100	Dogue Creek, Potomac River.....	26,100,000	
Oakwood, Moorman's mill pond.....		100	Freeman, Lake Racume.....		200
Pennsylvania:			Ivanhoe, New River.....	400,000	
Ephrata, Bucher's pond.....	100,000		Kents, Reedy Creek.....		300
Fahnestock's pond.....	100,000		Little Hunting Creek, Potomac River.....	23,894,000	
Goods Pond.....	100,000		Pemberton, DeNoon's pond.....	100,000	
Lesh's pond.....	100,000		Pohick Creek, Potomac River.....	22,401,000	
Moyers Pond.....	100,000		Richmond, Browns Pond.....	400,000	
Wabash Pond.....	100,000		Licking Creek Pond.....	300,000	
Hanover, Basehoar Creek.....	400,000		Wytheville, New River.....		300
Hendricks, Perkiomen Creek.....	400,000		Reed Creek.....	400,000	300
Moscow, Lake Henry.....		300	Wisconsin: La Crosse, Mississippi River.....		615,000
Muncey Valley, Eagles Mere Lake.....	500,000				
Point Marion, Monongahela River.....		200			
Pottstown, McFarland's pond.....	100,000				
Waterville, Big Pine Creek.....		200			
			Total c.....	{ 195,491,000 * 27,500,000	183,111

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others fry.<sup>b</sup> Rescued from overflowed lands and restored to original waters.<sup>c</sup> Lost in transit, 900 fingerlings.

## STRIPED BASS.

Disposition.	Fry.
North Carolina: Weldon, Roanoke River.....	10,071,000

*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## WHITE PERCH.

Disposition.	Fry and eggs. <sup>a</sup>	Disposition.	Fry and eggs. <sup>a</sup>
Connecticut:		New Hampshire—Continued.	
Twin Lakes, Lake Washines.....	400,000	Keene, Spofford Lake.....	400,000
Waterbury, Ryan Pond.....	300,000	Lakewood, Ossipee Lake.....	800,000
Maine:		Manchester, Deering Pond.....	400,000
Belfast, Cross Pond.....	300,000	Hadley Pond.....	400,000
Brooks, Passagassawamkeag Pond.....	400,000	Kendall Pond.....	300,000
Prime Pond.....	300,000	Pine Island Park Pond.....	300,000
Randall Pond.....	300,000	Meredith, Lake Winnepesaukee.....	600,000
Lewiston, Tacoma Lake.....	500,000	Newport, Long Pond.....	300,000
South Paris, Big Concord Pond.....	300,000	Sanbornville, Lovell Lake.....	400,000
Westcott, Little Ossipee Lake.....	500,000	Winchester, Forest Lake.....	400,000
Maryland:		New York:	
Battery, Chesapeake Bay.....	200,000	Mamakating, Masten Lake.....	400,000
Elk River, Chesapeake Bay.....	18,200,000	Newburgh, Orange Lake.....	400,000
Mill Creek, Chesapeake Bay.....	20,000,000	Pawling, Willow Pond.....	100,000
Swan Creek, Chesapeake Bay.....	47,000,000	North Carolina:	
Massachusetts:		Edenton, Albemarle Sound.....	250,000
Lowell, Keyes Pond.....	300,000	Edenton Bay.....	600,000
Lynn, Lower Pond.....	400,000	Vermont:	
Medfield, Jewell Pond.....	200,000	Rickers, Rickers Pond.....	300,000
Palmer, State fish commission.....	*15,000,000	Vergennes, Otter Creek.....	500,000
New Hampshire:			
Bristol, Newfound Lake.....	600,000		
Concord, Contoocook River.....	300,000		
State fish commission.....	*10,000,000		
		Total.....	( 97,350,000 *25,000,000

<sup>a</sup> Eggs are indicated by an asterisk, thus (\*); all others are fry.

## WHITE BASS.

Disposition.	Fingerlings.
Iowa: Bellevue, Mississippi River.....	<sup>a</sup> 4,950

<sup>a</sup> Rescued from overflowed lands and restored to original waters.

## COD.

Disposition.	Fry.	Disposition.	Fry.
Maine:		Massachusetts—Continued.	
Boothbay Harbor, Boothbay Har- bor.....	4,091,000	Gosnold, Buzzards Bay.....	21,488,000
Linekins Bay.....	1,425,000	Vineyard Sound.....	73,534,000
Massachusetts:		Manchester, Massachusetts Bay.....	9,530,000
Beverly, Massachusetts Bay.....	23,450,000	Marblehead, Massachusetts Bay.....	3,110,000
Chilmark, Vineyard Sound.....	19,228,000	Rockport, Atlantic Ocean.....	9,570,000
Falmouth, Buzzards Bay.....	3,493,000	Ipswich Bay.....	4,520,000
Nantucket Sound.....	34,279,000	Tisbury, Nantucket Sound.....	10,358,000
Vineyard Sound.....	6,500,000	Vineyard Sound.....	20,698,000
Gloucester, Atlantic Ocean.....	62,090,000	Woods Hole, Vineyard Sound.....	2,697,000
Ipswich Bay.....	8,620,000	Total.....	318,681,000

## POLLOCK.

Disposition.	Fry.	Disposition.	Fry.
Maine, Boothbay Harbor, Booth- bay Harbor.....	19,800,000	Massachusetts—Continued.	
Massachusetts:		Manchester, Massachusetts Bay.....	87,960,000
Beverly, Massachusetts Bay.....	141,970,000	Marblehead, Massachusetts Bay.....	58,200,000
Gloucester, Atlantic Ocean.....	506,680,000	Rockport, Atlantic Ocean.....	140,840,000
Ipswich Bay.....	78,990,000	Ipswich Bay.....	66,400,000
Massachusetts Bay.....	8,620,000	Total.....	1,107,460,000



*Details of distribution of fish and eggs, fiscal year 1916—Continued.*

## MACKEREL.

Disposition.	Fry.
Massachusetts: Gloucester, Atlantic Ocean.....	1,946,000

## HADDOCK.

Massachusetts:	
Gloucester, Atlantic Ocean.....	8,620,000
Rockport, Atlantic Ocean.....	7,330,000
Ipswich Bay.....	6,220,000
Total.....	22,170,000

## FLATFISH.

Disposition.	Fry.	Disposition.	Fry.
Maine:		Massachusetts—Continued.	
Boothbay Harbor, Boothbay Har- bor.....	50,825,000	Gloucester, Annisquam River....	34,040,000
Linekins Bay.....	108,918,000	Gloucester Harbor.....	102,000,000
Lobster Cove.....	5,947,000	Ipswich Bay.....	16,030,000
Mill Cove.....	15,124,000	Gosnold, Buzzards Bay.....	60,383,000
Sawyers Isle Cove.....	47,131,000	Hadley Harbor.....	89,948,000
Townsend Gut.....	75,284,000	Vineyard Sound.....	117,306,000
West Harbor.....	3,898,000	Manchester, Manchester Harbor...	9,540,000
East Boothbay, Linekins Bay.....	134,559,000	Massachusetts Bay.....	39,070,000
Southport, Ebencook Harbor.....	68,946,000	Provincetown, Provincetown Har- bor.....	19,116,000
Pig Cove.....	26,467,000	Tisbury, Nantucket Sound.....	44,991,000
Townsend Gut.....	46,308,000	Woods Hole, Eel Pond.....	9,914,000
Massachusetts:		Rhode Island: Wickford, Wickford Harbor.....	56,569,000
Chilmark, Menamaha Pond.....	19,634,000	Total.....	1,532,947,000
Vineyard Sound.....	44,622,000		
Falmouth, Buzzards Bay.....	28,602,000		
Great Harbor.....	12,394,000		
Nantucket Sound.....	245,081,000		

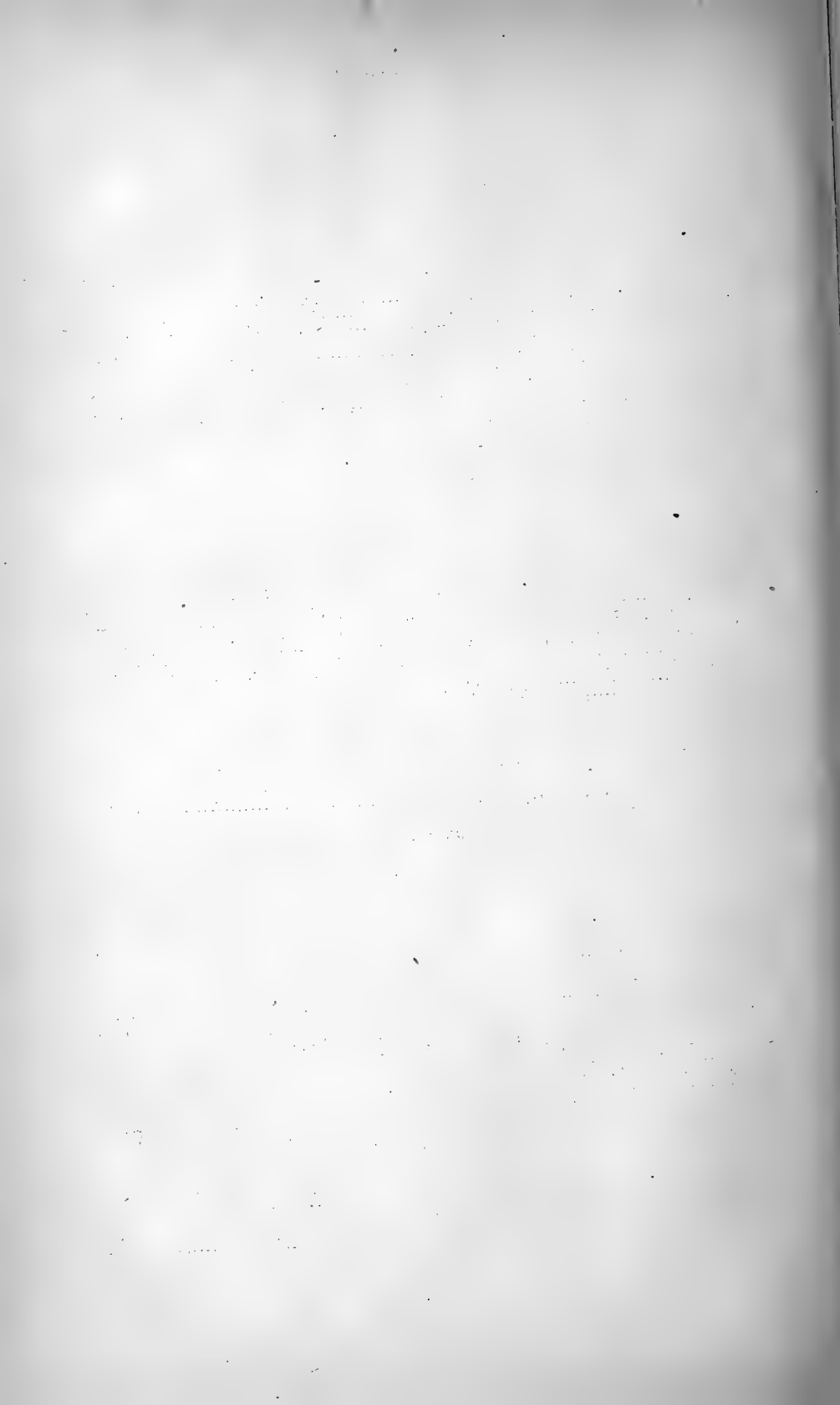
## BUTTERFISH.

Disposition.	Fry.
Massachusetts: Gloucester, Atlantic Ocean.....	392,000

## LOBSTER.

Disposition.	Fry.	Disposition.	Fry.
Maine:		Maine—Continued.	
Bass Harbor, Bass Harbor.....	6,000,000	Perkins, Perkins Cove.....	1,000,000
Biddeford Pool, Biddeford Pool.....	3,000,000	Port Clyde, Port Clyde Harbor....	4,500,000
Boothbay, Hodgkins Cove.....	3,000,000	Portland, Peakes Isle Roads.....	500,000
Mill Pond.....	3,000,000	Portland Harbor.....	500,000
Boothbay Harbor, Boothbay Har- bor.....	2,500,000	Prospect Harbor, Prospect Harbor..	2,000,000
Bristol, Johns Bay.....	10,000,000	Rockland, Rockland Harbor.....	6,000,000
Round Pond.....	2,000,000	Sebasco diggen, Quohog Bay.....	2,000,000
Cape Elizabeth, Cape Elizabeth Harbor.....	500,000	South Hancock, Skillings River....	15,000,000
Cape Porpoise, Cape Porpoise Har- bor.....	3,000,000	Southport, Pig Cove.....	2,000,000
Cranberry Isle, Cranberry Isle Har- bor.....	3,000,000	Townsend Gut.....	500,000
Dyers Neck, Yeaton Cove.....	4,000,000	South Thomaston, Seal Harbor....	4,500,000
East Boothbay, Linekins Bay.....	3,500,000	Stonington, Stonington Harbor....	7,000,000
Edgecomb, The Eddy.....	3,000,000	Vinal Haven, Mill River.....	6,000,000
Falmouth, Casco Bay.....	10,000,000	York Harbor, York Harbor.....	5,000,000
Friendship, Friendship Harbor.....	3,000,000	Massachusetts:	
Georgetown, Gotts Cove.....	3,000,000	Gloucester, Atlantic Ocean.....	130,000
Love Cove.....	500,000	Manchester, Massachusetts Bay....	70,000
Kennebunk Port, Kennebunk Port Harbor.....	1,000,000	New Hampshire:	
North Haven, Browns Cove.....	4,000,000	Little Harbor, Little Harbor.....	1,000,000
Pepperell, Pepperell Cove.....	1,000,000	Portsmouth, Portsmouth Harbor...	2,000,000
		Washington: Anacortes, Bellingham Channel.....	23,325
		Japan: Japanese Government.....	200
		Total.....	128,703,525

n Adults.



# ALASKA FISHERIES AND FUR INDUSTRIES IN 1916

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By **WARD T. BOWER**, *Agent*, and **HENRY D. ALLER**, *Assistant*

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Appendix II to the Report of the U. S. Commissioner of Fisheries for 1916



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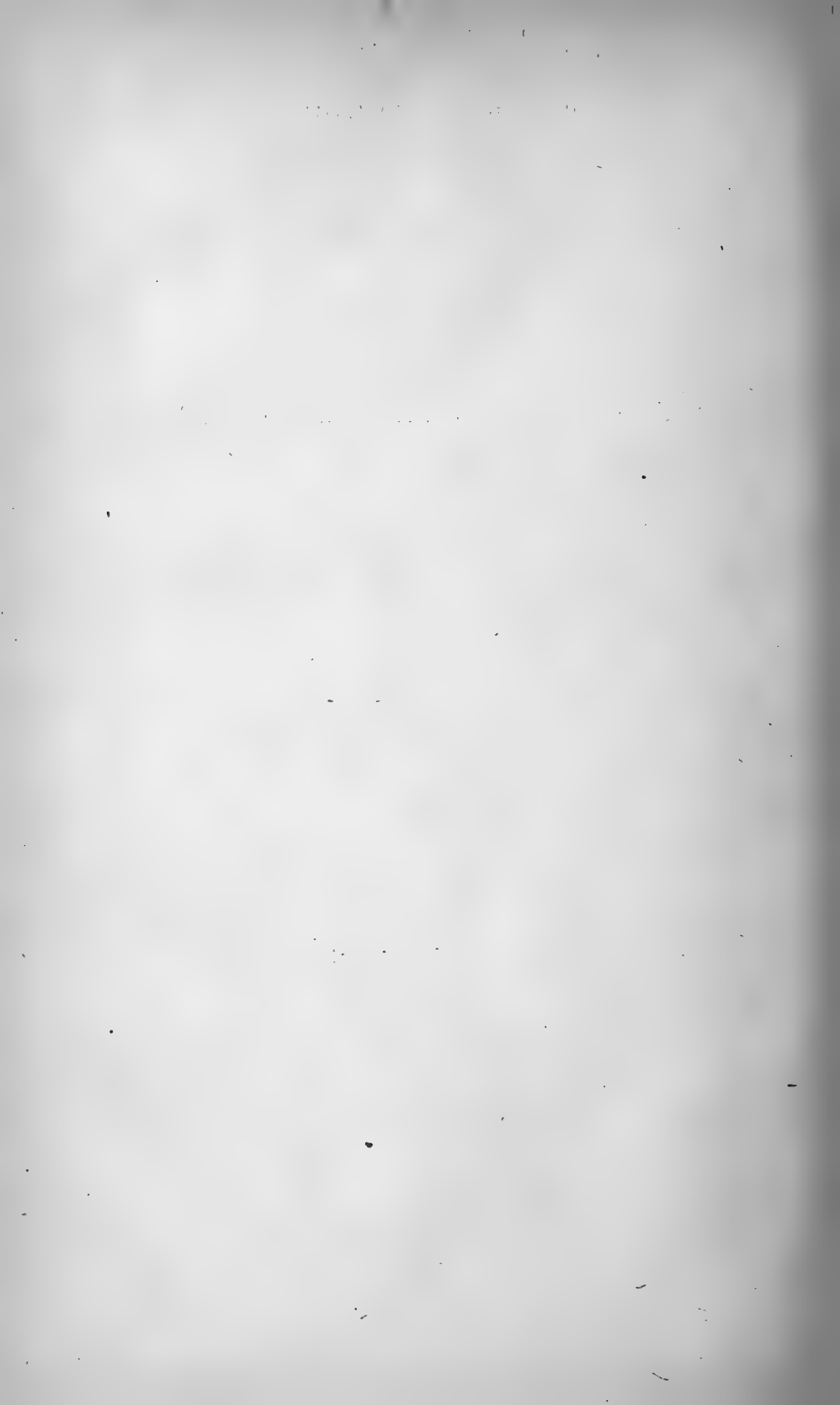
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# ALASKA FISHERIES AND FUR INDUSTRIES IN 1916.

By **WARD T. BOWER**, *Agent, Alaska Service*, and **HENRY D. ALLER**, *Assistant, Alaska Service*.

## INTRODUCTION.

As in previous years, the activities of the Bureau of Fisheries in respect to Alaska have been directed chiefly toward the enforcement of the law for the protection of the fisheries proper, the fur seals, and the fur-bearing animals generally; the collection of statistics and information in regard to the methods of the fisheries industries; the operation of hatcheries; and the continuance of scientific investigations along various lines.

In enforcing the law for the protection of the fisheries proper, field work was continued throughout the year, the work being increased by additional patrols during the active fishing season. Canneries and other fishery establishments were inspected. Some attention was given to improvement of stream channels so as to facilitate the ascent of spawning salmon. Private salmon hatcheries were inspected. The Federal hatcheries in Alaska are under the immediate direction of the division of fish culture of the Bureau, but certain information in regard to them has been incorporated in this report in order to present properly fish-cultural operations in the Territory. A count was made of the salmon ascending Wood River, Nushagak Bay, in the breeding season.

In connection with the enforcement of the law, including the North Pacific Sealing Convention of July 7, 1911, for the protection of fur seals, the Bureau maintained its regular stations at the Pribilof Islands; attended to the support, education, and health of the natives of those islands; preserved the sealskins taken from seals killed for food for the natives; secured such skins from the blue-fox herds of the Pribilofs as could properly be taken; and made a census of the fur-seal herd. Attention was also given to the marking and authenticating of fur-seal skins legally taken by Indians of the State of Washington and to the suppression of traffic in sealskins not authenticated as to their legal status. The patrol of the North Pacific Ocean and Bering Sea for the protection of fur seals and sea otters was carried on as in previous years by vessels of the Coast Guard.

Field work was continued throughout the year to secure proper protection to the fur-bearing animals in Alaska generally. As far as practicable, information was obtained in reference to fur-farming

operations. The collecting of statistics of the furs shipped from Alaska was continued.

In addition to regular duties, attention was given to various incidental matters, several of them of importance. Among these may be mentioned proposed legislation involving (a) revision of the general fisheries laws of Alaska, (b) preservation of the Pacific halibut fishery as a national industry, and (c) proposed joint action between the United States and Canada for the establishment of an annual close season for the Pacific halibut and of a reserved area as a nursery ground for this fish. Other matters had to do with (a) the joint administration with the Department of Agriculture of the Aleutian Islands Reservation, (b) cooperation with the Interior Department in connection with the Annette Island Fishery Reserve, (c) the leasing of islands for fur-farming purposes, (d) the construction of new boats for patrol work, and (e) the holding of a hearing at Seattle to determine the advisability of limiting fishery operations in the Situk River, southeastern Alaska.

In the compilation of the statistical tables of the fisheries proper appearing in this report valuable assistance has been rendered by Assistant Agent E. M. Ball. Assistant Agent H. J. Christoffers has assisted in compiling certain parts of the data pertaining to the fur seals and other fur-bearing animals.

#### EMPLOYEES, ALASKA SERVICE.

During the year 1916 the following regular employees have been identified with the Alaska service of the Bureau:

##### REGULAR EMPLOYEES IDENTIFIED WITH THE ALASKA SERVICE IN 1916.

Name.	Position.	Headquarters or chief place of duty.
Ward T. Bower.....	Agent, Alaska service.....	Washington, D. C.
Henry D. Aller.....	Assistant, Alaska service.....	Do.
Edward M. Ball.....	Assistant agent.....	Kodiak, Alaska.
Harry J. Christoffers.....	do.....	Unalaska, St. Paul Island, and Seattle.
Ernest P. Walker.....	Inspector.....	Wrangell.
James H. Lyman.....	Assistant agent.....	Cordova. (Transferred Sept. 16, 1916, from position of warden.)
Harry C. Fassett.....	Agent and caretaker.....	St. Paul Island.
A. H. Proctor.....	do.....	St. George Island.
G. Dallas Hanna.....	Storekeeper.....	St. Paul Island. (Transferred Sept. 16, 1916, from position of assistant agent.)
Robert H. Bishop.....	do.....	St. Paul Island. (Separated from service June 30, 1916.)
William B. Hunter.....	Physician.....	St. Paul Island. (Resigned July 31, 1916.)
William T. Miles.....	do.....	St. Paul Island. (Appointed Sept. 1, 1916.)
Henry P. Adams.....	do.....	St. George Island.
George Haley.....	School-teacher.....	St. Paul Island.
Cora Giles Haley.....	do.....	Do.
Arnold C. Reynolds.....	do.....	St. George Island.
Calvin F. Townsend.....	Warden.....	Fairbanks.
Fred H. Gray.....	do.....	Wrangell.
Shirley A. Baker.....	do.....	Dillingham.
Harry H. Brown.....	do.....	Nushagak.
Christian L. Larson.....	do.....	Chicken. (Transferred Sept. 1, 1916, from position of special warden.)
William P. Hemenway.....	do.....	Tanana. (Resigned July 31, 1916.)
Henry C. Scudder.....	do.....	St. Paul Island. (Appointed June 1, 1916.)
Edwin Hotstad.....	Master steamer Osprey.....	Wrangell.
Albert K. Brown.....	Clerk.....	Washington, D. C.
Mary S. Haines.....	do.....	Do.
William P. Rasin.....	do.....	Do.
E. Elaine Bell.....	do.....	Seattle.

## REGULAR EMPLOYEES AT GOVERNMENT HATCHERIES IN ALASKA IN 1916.

Name and location.	Position.
<b>Afognak:</b>	
G. R. Hoffses.....	Superintendent. (Transferred Aug. 16, 1916, to superintendent, Washington stations.)
Edwin Wentworth.....	Superintendent. (Promoted Aug. 16, 1916, from foreman, Puget Sound Stations.)
Joseph Kemmerich.....	Foreman. (Promoted Mar. 1, 1916, from car service. Transferred Aug. 16, 1916, to foreman. Puget Sound stations.)
G. C. Robertson.....	Foreman. (Promoted Aug. 16, 1916, from skilled laborer, Yes Bay station.)
Jesse Robbins.....	Skilled laborer. (Drowned Feb. 9, 1916.)
John Naumoff.....	Skilled laborer.
W. E. Sullivan.....	Skilled laborer. (Promoted Dec. 1, 1916, from apprentice fish culturist, Duluth, Minn.)
Frank S. Morton.....	Skilled laborer. (Promoted May 16, 1916, from apprentice fish culturist same station. Transferred Oct. 16, 1916, to fish culturist, Saratoga, Wyo.)
Alfred Nelson.....	Apprentice fish culturist.
Nicolai Boskofsky.....	Do.
Russell Noyes.....	Apprentice fish culturist. (Transferred Sept. 1, 1916, from Saratoga, Wyo.)
F. J. Stewart.....	Cook.
<b>Yes Bay:</b>	
Charles B. Grater.....	Superintendent. (Promoted July 1, 1916, from foreman, same station.)
William K. Hancock.....	Superintendent. (Transferred Mar. 1, 1916, to superintendent, Baird, Cal.)
Hugh C. Mitchell.....	Superintendent. (Promoted Mar. 1, 1916, from foreman, Baird, Cal. Transferred May 1, 1916, to superintendent, Clackamas, Oreg.)
C. H. Van Atta.....	Foreman. (Promoted Aug. 20, 1916, from fish culturist, Leadville, Colo.)
Kenneth P. Hutton.....	Skilled laborer. (Promoted Aug. 16, 1916, from apprentice fish culturist, same station.)
J. H. Tierney.....	Skilled laborer.
John H. Brunson.....	Apprentice fish culturist. (Promoted June 1, 1916, to skilled laborer. Clackamas, Oreg.)
Henry C. Scudder.....	Apprentice fish culturist. (Promoted June 1, 1916, to warden, Alaska Service.)
Clarence B. Rivers.....	Apprentice fish culturist. (Transferred from Clackamas, Oreg., June 1, 1916.)
C. N. Blystad.....	Apprentice fish culturist. (Transferred from Homer, Minn., Aug. 16, 1916.)
T. H. Morton.....	Apprentice fish culturist. (Appointed June 12, 1916.)
L. N. Robertson.....	Cook. (Resigned Aug. 31, 1916.)
M. T. Tierney.....	Cook. (Appointed Sept. 1, 1916.)

## FISHERY INDUSTRIES.

As in similar reports for previous years, the Territory of Alaska is here considered in the four coastal geographic sections generally recognized as follows: Southeast Alaska, embracing all that narrow strip of mainland and the numerous adjacent islands from Portland Canal northwestward to and including Yakutat Bay; central Alaska, the region on the Pacific from Yakutat Bay westward, including Prince William Sound, Cook Inlet, and Chignik; western Alaska, the shores of Bering Sea, tributary waters, and the islands in Bering Sea; and arctic Alaska, all that portion of Alaska facing on or tributary to the Arctic Ocean.

Detailed reports and statistical tables dealing with the various fishery industries are presented herewith, and there are also given the important features of certain subjects which were the object of special investigation or inquiry.

### WATERS CLOSED TO COMMERCIAL FISHING.

No additional waters were closed to commercial fishing in 1916. A hearing was held at Seattle on December 15, 1916, to determine the advisability of limiting fishing operations in the Situk River. It was not developed definitely that the red-salmon fishery of that stream is in any danger of depletion. After reviewing the facts brought out at the hearing, the Department decided to place no limitations upon fishing at present but to make a further investigation of conditions on the Situk River in 1917.

In accordance with previous orders the following waters have been set aside as salmon-breeding reserves, wherein all fishing for salmon or other fishing in the prosecution of which salmon are taken or injured is prohibited: In southeast Alaska—Anan Creek, Naha Stream, all waters tributary to Barnes Lake, Prince of Wales Island, Hetta Creek and its tributary waters and the region within 500 yards of the mouth of said creek, and Sockeye Creek, its tributary Boca de Quadra waters, and the region within 500 yards of the mouth of said creek; in central Alaska—all streams flowing into Cook Inlet, Eyak Lake, and a limitation on fishing in Eyak River; in western Alaska—Wood and Nushagak Rivers. In addition, limitations have been placed upon fishing by authority of Executive order and proclamation in the waters of Afognak Reservation, Aleutian Islands Reservation, and Yes Bay and Stream. Limitations upon fishing also exist in the Annette Island Fishery Reserve, which was created by Presidential proclamation of April 28, 1916. This reserve is discussed more fully elsewhere in this report.

## PATROL BOATS.

One of the important duties of the Bureau in Alaska is the maintenance of a patrol for the enforcement of the fisheries laws and regulations. This work has been confined chiefly to the waters of southeast Alaska, where fishing operations are more intensive than in other parts of the Territory. Facilities and funds have been entirely inadequate for even most ordinary demands, although improvements are hoped for soon. As a step in this direction, Congress appropriated \$10,000 in 1916 for the purchase or construction of two patrol boats for the Alaska fisheries service. In December a contract was made for the construction of these boats at Seattle. It is expected that they will be in readiness for service in the summer of 1917. These boats will be 48 feet in length and 12½ feet in breadth and will be equipped with 25-30 horsepower, heavy-duty engines of western make. These boats are to be of the seaworthy, purse-seine boat type familiar to the Pacific coast. There will be accommodations for a crew of three forward, and a cabin aft will accommodate three persons.

These boats will be of material assistance in the patrol work, but they ought to be supplemented by at least two other boats of similar construction for southeastern Alaska and by two boats approximately 65 feet in length for the more exposed waters of central Alaska, and still further by the addition of two larger vessels for the remote and exposed waters of western Alaska and Bering Sea. As in seasons past, it has been necessary for the Bureau's agents to accept gratuities in the way of transportation from companies engaged in the commercial fishery. This is objectionable in every way, but until such time as more boats are provided for the inspection service, it will be practically impossible to reach some of the sections without occasionally traveling on boats owned by the fishery companies.

The inadequacy of the Bureau's facilities for patrol work in the Afognak-Kodiak region is evidenced by the fact that one of the agents has been forced to use an open dory, with a small outboard motor, for inspection purposes in the waters of that region. On account of the heavy weather experienced frequently and the exposed character of these waters, it is expecting altogether too much of an employee to risk his life in the perils of such work.

The patrol work in southeast Alaska in 1916 was accomplished by the Bureau's steamer *Osprey* (23 tons) and the chartered power boats *Murrelet* (6 tons) and *Standard* (15 tons). Two smaller power boats were also chartered for brief periods. In central Alaska the auxiliary schooner *Nimrod* (8 tons) was under charter for a few weeks for use on Cook Inlet and to the westward, and the power boats *Shamrock* (7 tons) and *Prospector* (7 tons) were chartered for short periods for use in the Prince William Sound region. In western Alaska a small power boat was used for a short time to patrol

the waters of Nushagak Bay. The Bureau's steamer *Osprey* cruised 4,180 miles in southeast Alaska in the calendar year 1916. Near the conclusion of active fishing operations, boiler trouble developed, and in October the vessel was towed to Seattle for repairs or other disposition. The vessel was at Seattle at the end of the year. The total cost of patrol work for the year, including salaries of regular employees while engaged in this service, was approximately \$5,000.

#### VIOLETIONS OF LAWS AND REGULATIONS.

The violations of the fishery laws coming to the attention of the Bureau's agents in 1916 included fishing in the weekly close season, fishing in prohibited areas, and with apparatus set too close to other fishing gear. The wanton waste of fish was also charged in two instances not yet brought to trial.

Two indictments returned by the grand jury at Seward on October 15, 1914, against the Alaska Packers Association, charging it with the wanton waste of salmon in connection with its Kasilof cannery, were disposed of at the September, 1916, term of the United States district court at Valdez. The jury returned a verdict of guilty in the first case, whereupon an appeal was entered by the defendant. The second case was dismissed.

Two indictments against Libby, McNeill & Libby, returned by the grand jury at Valdez in 1915, for having wantonly wasted salmon, were consolidated, and the case was tried at Valdez in September, 1916. The defendant was acquitted.

The Deep Sea Salmon Co. was tried and acquitted at the September, 1916, term of the United States district court at Valdez on the first of the three indictments returned against it by the grand jury at Valdez in September, 1915. The two other indictments were dismissed.

An indictment, returned by the grand jury in September, 1915, against the Northwestern Fisheries Co. for unlawful fishing at Alaganik Slough, Copper River Delta, was tried at Valdez in September, 1916. The company entered a plea of guilty, and a fine of \$100 was imposed.

Three indictments were returned by the grand jury at Valdez against Halmar Folvik and Ingwald Martinson for fishing on Sunday, June 25, 1916, with two anchored gill nets in the waters of Gumboot Creek, Eshamy Bay, and for fishing on two occasions within 100 yards of the mouth of that creek, it being a red-salmon stream less than 500 feet in width. Both pleaded guilty and were fined \$5 each.

Two indictments were returned by the grand jury at Valdez against Hans Steinfeldt for having set two anchored gill nets in Mountain Slough on Sunday, May 28, 1916. The defendant was brought to trial on October 23, entered a plea of guilty, and was fined \$10.

E. Paulson, of Ellamar, was indicted by the grand jury at Valdez for fishing with four anchored gill nets in Eshamy Bay and Lagoon on Sunday, July 9, 1916. When brought to trial at Valdez he pleaded guilty and was fined \$1.

Peter Jackson was tried at Valdez in October on an indictment returned against him by the grand jury for stretching a gill net more than one-third the distance across Miners River, a red-salmon stream in Unakwik Inlet, on July 21, 1916, and for setting a gill net within 100 yards of another gill net at the same time and place. The defendant entered a plea of guilty and was fined \$1.

Indictments returned by the grand jury at Valdez accused the Canoe Pass Packing Co. of having wantonly wasted salmon on July 22 and 23, 1916, in Windy Bay, Alaska. When brought to trial their counsel entered a plea of not guilty and asked for a continuance of the case, which was granted. The case will probably be taken up again at the spring term of court in 1917.

Indictments returned against Nils Nelson and the Carlisle Packing Co. for fishing with two gill nets in Eshamy Bay on Sunday, July 9, 1916, were not acted upon at the fall term of court, but will undoubtedly be taken up in the spring of 1917.

Indictments were returned by the grand jury at Valdez against Hjalmar Swanson, Ole Sandanger, Mat Jacoban, Nick Nilson, and the Carlisle Packing Co. for fishing with a purse seine within 100 yards outside of the mouth of Gumboot Creek, a red-salmon stream in Eshamy Bay less than 500 feet in width on July 18, 1916; for fishing within 100 yards of a gill net on the same day and place, and for fishing on July 20 within 100 yards of a gill net set in Eshamy Lagoon. The first four mentioned when brought to trial entered a plea of guilty and were each fined \$10. The case against the Carlisle Packing Co. has not come to trial, but will probably be acted upon at the spring term of court in 1917.

Cases resulting from the indictments returned by the grand jury at Valdez in 1915 against George Osborn, Norman Erickson, John Jackson, and John Nockintah for placing a set net more than one-third the width of the stream in Mountain Slough, near Cordova, were not tried at the fall term of court, but may be taken up in the spring of 1917.

Complaint was made by a representative of the Bureau of Fisheries before the United States commissioner at Wrangell against Gus Lehner, Michael Gregoff, and I. Olsegwigo for fishing on Sunday, September 3, 1916, in Blind River, Wrangell Narrows. All pleaded guilty and were fined \$5, \$10, and \$5, respectively, and costs. The costs in each case amounted to \$7.35.

On July 1 action was brought in the United States commissioner's court at Wrangell against Olif Oleson for illegally fishing in the

lagoon at Anan Creek on June 28, 1916. The defendant put in the plea that his net had drifted in with the tide. He was discharged by the court with an admonition.

On July 31, while visiting Anan Bay, southeast Alaska, a warden found the boat *Zora*, of Seattle, fishing for salmon with a seine one end of which was attached to the corner of a fish trap. This was in violation of section 4 of the fisheries act approved June 26, 1906, which forbids the setting of a seine or other net within 100 yards of any other fishing appliance. The warden took the boat and crew to Wrangell and made complaint before the United States commissioner against the captain, August Budnich. The defendant pleaded guilty and was fined \$120 and costs.

On Sunday, August 20, 1916, one of the Bureau's wardens found three boats fishing in Chilkoot River. On the same day he discovered 31 set nets in Chilkoot Lake. The nets were taken to Haines and turned over to the United States marshal, and complaints were sworn out against the operators of the three boats and the 28 operators of the set nets. On August 21 the three boat cases were tried before the United States commissioner at Haines. All the defendants pleaded guilty, and each was fined \$25 and costs. The trials of the set-net operators were held on August 23 and 24. All the defendants pleaded guilty and were fined from \$1 to \$250 each and costs.

On September 5, 1916, the circuit court of appeals at San Francisco affirmed the decision of the lower court in the case appealed by the Thlinket Packing Co. in respect to not closing certain pound nets in accordance with the weekly close period requirement of law.

#### WAR DEPARTMENT REGULATIONS.

In order to meet the requirements of law in regard to the erection of structures in navigable waters, the War Department issued, on March 15, 1916, the following regulations setting forth the conditions under which permission may be secured to construct pound nets in the waters of Alaska.

WAR DEPARTMENT,  
OFFICE OF THE CHIEF OF ENGINEERS,  
*Washington, March 15, 1916.*

*To whom it may concern:*

The attention of those fishing in the waters of the coast of the Territory of Alaska, and in the navigable waters tributary thereto, is called to the provisions of section 10 of the river and harbor act of March 3, 1899, as follows:

Extract Section 10: "That the creation of any obstruction not affirmatively authorized by Congress to the navigable capacity of any of the waters of the United States is hereby prohibited; and it shall not be lawful to build or commence the building of any \* \* \* weir \* \* \* or other structure in any \* \* \* navigable river or other waters of the United States, outside established harbor lines, or where no harbor lines have been established, except on plans recommended by the Chief of Engineers and authorized by the Secretary of War."



In accordance with the above provision of law, and until further notice, all fishermen who desire to operate in the waters above described, and under conditions stated as follows, but not otherwise, and whose written applications may receive the approval of the engineer officer of the United States Army in charge of the locality, are hereby authorized by the Secretary of War to construct and maintain fish weirs, traps, or pounds erected in the usual manner as heretofore, subject to the following conditions:

#### CONDITIONS.

1. All persons desiring to erect and maintain fish weirs, traps, or pounds, under this authority shall make application to the engineer officer of the United States Army, Seattle, Wash., giving their names, their addresses, the proposed location of their weir, trap, or pound, and evidence that the proper license has been granted by the Territory of Alaska.

2. That this authority does not give any property rights either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to private property or invasion of private rights, or any infringement of Federal, Territorial, or local laws or regulations, nor does it obviate the necessity of obtaining Territorial assent to the work authorized. *It merely expresses the assent of the Federal Government so far as concerns the public rights of navigation.* (See *Cummings vs. Chicago*, 188 U. S. 410.)

3. That all the apparatus used and the work herein authorized shall be subject to the supervision and approval of the aforesaid engineer officer, who may temporarily suspend the work at any time if, in his judgment, the interests of navigation so require.

4. That no weir, trap, or pound shall be located or built in such place or manner as to unreasonably obstruct or interfere with navigation.

5. That on the outer end of the weir, trap, or pound the grantee or owner shall maintain a sign inscribed with the license number in numerals not less than 6 inches in height capable of being readily read from passing vessels, and failure to keep such sign conspicuously displayed shall be sufficient reason for the cancellation of this authority and for prosecution as provided in the next paragraph. All renewals of the Territorial license shall be reported to the aforesaid engineer officer when they occur, together with the Territorial license number. All changes of ownership shall also be reported to him immediately, and the permit shall be returned to him for proper notation thereon of such changes.

6. That upon the abandonment of the location or upon ceasing to use any weir, trap, or pound as hereby authorized, the permit and the map or maps attached thereto shall be immediately returned to the aforesaid engineer officer with notice of the abandonment, and the owner shall immediately remove the structure at his own expense, including all piling, stakes, etc., to the satisfaction of the aforesaid engineer officer. Failure to so remove the same shall be considered good ground for prosecution of the grantee or owner for maintaining an illegal structure endangering navigation, as set forth in sections 10 and 12 of the river and harbor act of March 3, 1899. Provided, that if the use of said structure is suspended temporarily, it may be maintained in whole or in part if the license number is conspicuously displayed and the trap is properly lighted or otherwise marked as may be necessary to prevent unreasonable obstruction to navigation. Any fish weir, trap, or pound allowed to go into a condition of disrepair so that it can not be readily seen, or on which the license number is not conspicuously displayed, will be regarded as abandoned, and if not promptly removed or marked as above provided will subject the grantee or owner to prosecution, and any trap not in use on which the license number is not displayed will be subject to removal by the United States at any time.

7. That if future operations by the United States require an alteration in the position of the weir, trap, or pound, or if the latter, in the opinion of the Secretary of War, shall cause unreasonable obstruction to the free navigation of the said waters, the grantee will be required upon due notice from the Secretary of War and within 30 days thereafter, to remove or alter the weir, trap, or pound, or obstruction caused thereby, without expense to the United States, so as to render navigation reasonably free, easy and unobstructed. No claim shall be made against the United States on account of such removals or alterations.

8. That fishing structures and appliances in navigable waters of the United States shall be lighted for the safety of navigation, as follows:

"The lights shall be displayed between sunset and sunrise. They shall be placed at each end of the structure excepting where the inner end terminates in such situation that there is no practicable navigation between it and the high water line of the adjacent coast, in which case no inner light shall be displayed. The outer light shall be

displayed. The outer light shall be white and the inner light shall be red. The size, capacity, and manner of maintenance of the lights shall be such as may be specified in the War Department permit authorizing the erection of the structure or appliance.

When several structures or appliances are placed on one line with no navigable passage between them, they will be considered, for lighting purposes, as one structure.<sup>1</sup>

9. That there shall be installed and maintained on the weir, trap, or pound by and at the expense of the grantee, such additional lights and signals as may be prescribed by the Bureau of Lighthouses, Department of Commerce, and that provision shall be made by watchman or otherwise for proper attendance of lights and signals, so that they will at all times be in effective condition.

10. That this authority is revocable at will by the Secretary of War and unless otherwise specified in the permit, or unless previously revoked under paragraph (7) above, shall cease and be null and void (date to be specified by district officer, not more than five years after date of issuance of permit).

By authority of the Secretary of War.

H. TAYLOR,  
*Colonel, Corps of Engineers,  
Acting Chief of Engineers, U. S. Army.*

### TERRITORIAL LEGISLATIVE NOTES.

There has been much controversy between the fishery interests and the Territory of Alaska as to whether the Territory has the power under the terms of the enabling act of August 24, 1912, to levy license taxes upon the fisheries in addition to the license fees imposed by the Federal Government. The Territorial Legislature at its session in 1913, and again in 1915, imposed additional taxes upon the fishery industry. By the terms of the Territorial act of May 1, 1913, a license tax of 7 cents per case was levied on sockeye and king salmon, and one-half cent per case on humback, coho, and chum salmon; also cold-storage fish plants were required to pay a license tax of from \$10 to \$500 per annum in accordance with the amount of business transacted. This measure became effective July 30, 1913, or after most of the pack of salmon for that season had been put up, particularly in the Bristol Bay district, where the heaviest pack of red salmon is made.

The Territorial revenue act of April 29, 1915, repealed the act of May 1, 1913, except in so far as certain features were reenacted, but it was stipulated that the act of 1915 did not relieve any person or corporation from the payment of the license taxes and penalties due under the revenue and taxation act of 1913. The act of 1915 imposes a territorial tax of 4 cents a case on king and red, or sockeye, salmon, 2 cents a case on cohos or medium reds, and 1 cent a case on all other species canned; also fixed or floating traps or pound nets are required to pay \$100 per annum, so-called dummy traps included; and gill nets \$1 per hundred fathoms or fraction thereof. A license tax of 2½ cents per 100 pounds is also imposed on salted or mild-cured fish, except herring, and a tax of from \$10 to \$500 per annum is also levied on cold-storage plants according to the amount of business done.

<sup>1</sup> Regulation of Department of Commerce, approved June 19, 1913.

If the Territorial license tax is a fixed sum, the amount thereof must accompany the application for license. If it is not a fixed sum, the applicant for a license must agree to pay the license tax on or before the 15th day of the next ensuing January. All Territorial license taxes, except those where the tax is a fixed one, are due and payable on December 31 of each year and must be paid on or before January 15 following. Thus the license fees on traps are payable in advance with the application, but the fees under the other fishery schedules in the act of 1915 are not due until December 31 and are not delinquent until after January 15. The penalty for failure to comply with the provisions of the act is a fine of the amount of the tax with 10 per cent added. Each month or fraction of a month in which business is carried on in violation of the act is deemed a separate offense.

The contention regarding the validity of the Territorial license acts mentioned finally led to an agreement between the fishery interests and counsel for the Territory to institute a test case with a view to having the matter settled definitely by the courts. The agreement was to the effect that no attempt would be made by the Territory to collect the fishery taxes until decision in court of last resort was reached, and in the event the decision was favorable to the Territory the license taxes in dispute were to be paid with interest at the rate of 8 per cent from date due to date paid in lieu of the heavier penalty provided by law. At Juneau in December, 1915, Judge Jennings of the district court rendered a decision in favor of the Territory. The case was taken to the circuit court of appeals for the ninth circuit at San Francisco, and on September 5, 1916, that court affirmed the decision of the lower court. The matter is now pending in the Supreme Court of the United States, where it was taken by writ of error, writ of certiorari having been denied. The case is set for hearing in the Supreme Court in October, 1917.

According to information furnished by W. G. Smith, Territorial treasurer of Alaska, the amounts of fishery license taxes claimed by the Territory for the years 1913 to 1916, inclusive, were as follows: For 1913, \$10,144.22; for 1914, \$102,005.89; for 1915, \$130,698.26; and for 1916, \$157,627.94; total, \$400,476.31.<sup>a</sup> The comparatively small amount claimed for the year 1913 is accounted for by the fact that the act imposing the taxes did not become effective until July 30, 1913.

<sup>a</sup> Under date of April 4, 1917, Mr. Smith advised that J. H. Cobb, who was counsel for the Territory of Alaska when the agreement was reached regarding disputed fishery license taxes, was succeeded by George Grigsby, who was elected attorney general of Alaska in the fall of 1916. Early in 1917, Mr. Grigsby claimed that the test case had reached the court of last resort and demanded the payment of the taxes with interest, threatening suit against each individual or company with all penalties provided by Territorial law unless the taxes were settled. It is understood that March 31, 1917, was the limit of the time given for settlement. Mr. Smith advises that settlements under protest began about March 21, and that to the date of his communication on April 4 practically a full collection had been made for the years 1913, 1914, 1915, and 1916.

Collections in part of these amounts were made on or before December 31, 1916, as shown by the following table, based upon the Territorial treasurer's report to the third session of the legislature of Alaska for the biennium ending December 31, 1916:

FISHERY LICENSE TAXES COLLECTED BY TERRITORY FOR YEARS 1915 AND 1916, THROUGH DECEMBER 31, 1916.

Schedule.	Division No. 1.		Division No. 2.		Division No. 3.		Division No. 4.		Total.
	1915	1916	1915	1916	1915	1916	1915	1916	
Canneries.....	\$757.18	\$800.60	-----	-----	\$587.36	\$436.44	-----	-----	\$2,581.58
Salteries.....	69.85	82.93	\$2.55	\$0.20	734.07	35.94	-----	-----	925.54
Fish traps.....	13,800.00	22,034.28	-----	-----	7,700.00	14,336.68	-----	-----	57,870.96
Gill nets.....	165.01	92.00	7.10	2.00	15.00	59.00	\$2.00	-----	342.11
Cold storage plants.....	250.50	175.00	-----	-----	-----	-----	-----	-----	425.50
Total.....	15,042.54	23,184.81	9.65	2.20	9,036.43	14,868.06	-----	2.00	62,145.69

#### PROPOSED FISHERY LEGISLATION IN CONGRESS.

With the object of broadening the scope of the Federal Alaska fisheries act of June 26, 1906, and for the purpose of defining the powers of the legislature of Alaska in respect to the levying of license taxes upon the fisheries, a bill (H. R. 9528) was introduced on January 20, 1916, by Representative Alexander, of Missouri, and referred to the Committee on the Merchant Marine and Fisheries, of which Representative Alexander was chairman. Extended hearings were conducted on this bill through the spring and summer of 1916, and as a result a substitute committee bill (H. R. 17499) was introduced by Representative Alexander on August 18, 1916. This measure was reported favorably on August 29 by the Committee on the Merchant Marine and Fisheries. It was discussed in the Committee of the Whole House on the state of the Union on December 13, 1916, but did not come to a vote.

The contention has been made by the fishery interests that the dual system of taxation which results if the Territory has the right to levy additional license fees is burdensome and as a matter of equity should be discontinued. A bill (H. R. 9527) having this object in view was introduced on January 20, 1916, by Representative Alexander, of Missouri, and referred to the Committee on Territories. Several hearings were held on the measure, but no further action was taken by the committee.

On February 22, 1916, Representative Nolan, of California, introduced a bill (H. R. 12029) the chief purpose of which was to limit the size of the mesh of gill nets used in the red salmon fishery of Bering Sea and tributary waters to 5½ inches stretched mesh. This bill was referred to the Committee on the Merchant Marine and Fisheries. It was the purpose of the committee to offer the substance

of this measure as an amendment to the general Alaska fisheries bill (H. R. 17499), referred to in the foregoing. The placing of a limitation upon the size of the mesh of nets, as contemplated by this bill, met with general approval.

On account of the peculiar conditions which obtain in respect to the halibut industry, and in order that a comprehensive review of the situation may be presented as a more complete unit, it has been deemed best to discuss proposed special legislation on the subject under the general topic of the halibut fishery.

#### EXPENDITURES FOR ALASKA FISHERIES.

From time to time there has been some interest in regard to the amount of money expended by the Federal Government in its fisheries work in Alaska. The statement which follows covers such expenditures for the period of the 10 fiscal years from 1906 to 1915, inclusive. This statement does not cover any expenditures on account of the fur seals or other fur-bearing animals. Under the caption of "Fish culture" will be found the amount expended at the two Government hatcheries, and the reference to protection represents expenditures chiefly for enforcing the fisheries laws and regulations. The figures regarding the steamer *Albatross* are in reality chiefly for work of a scientific nature, but for the purposes of this record are segregated from the figures referring to scientific and statistical investigations.

STATEMENT OF EXPENDITURES BY BUREAU OF FISHERIES ON ACCOUNT OF ALASKA FISHERIES FOR FISCAL YEARS 1906 TO 1915, INCLUSIVE.

Fiscal year.	Fish culture.	Protection.	Investigations, scientific and statistical.	Investigations, steamer Albatross.	Total.
1906.....	\$25,832.66	\$5,560.00		\$6,000.00	\$37,392.66
1907.....	24,598.98	7,000.00	\$353.86		31,952.84
1908.....	50,181.38	7,000.00	307.75		57,489.13
1909.....	38,782.70	7,000.00	834.00		46,616.70
1910.....	28,314.49	7,000.00	1,626.39		36,940.88
1911.....	29,373.50	9,022.27	83.50	17,000.00	55,479.27
1912.....	31,838.77	14,111.45		7,500.00	53,450.22
1913.....	30,675.52	28,410.87	620.57		59,706.96
1914.....	31,485.96	25,991.42	738.13	8,000.00	66,215.51
1915.....	34,041.02	29,679.57			63,720.59
Total.....	325,124.98	140,775.58	4,564.20	38,500.00	508,964.76

#### WOOD RIVER CENSUS.

A census of the salmon ascending Wood River and entering Lake Aleknagik to spawn was again taken in 1916 by Warden H. H. Brown. This investigation was first started in 1908 and has been continued each year since, with the single exception of 1914.

The winter of 1915-16 was exceptionally cold in the Bristol Bay region. On June 15, at the time the equipment for the installation

of the rack arrived at Lake Aleknagik, scattering blocks of ice were found on the shores and a few hundred feet inland large drifts of snow still remained. As a result, it was naturally expected that the first run of fish would be late.

The installation of the rack was completed on June 23. On the same day counting commenced and was continued daily up to and including August 12. The maximum count of 57,237 fish was made on July 7, the same day as in 1915. On July 17 a second large count was made, consisting of 55,864 fish. There were three distinct large runs, which reached their maxima on July 7, 13, and 17, respectively. This may have been due to a temporary cessation of fishing as a result of severe storms occurring on Nushagak Bay, thus giving a larger number of fish an opportunity to ascend Wood River.

The following table shows the tally of salmon at the Lake Aleknagik (Wood River) rack in 1916:

Date.	Number.	Date.	Number.	Date.	Number.
June 23.....	64	July 11.....	6,581	July 29.....	1,014
June 24.....	95	July 12.....	33,828	July 30.....	1,512
June 25.....	123	July 13.....	47,343	July 31.....	1,182
June 26.....	138	July 14.....	42,859	Aug. 1.....	897
June 27.....	1,041	July 15.....	5,235	Aug. 2.....	688
June 28.....	1,996	July 16.....	24,758	Aug. 3.....	247
June 29.....	1,156	July 17.....	55,864	Aug. 4.....	308
June 30.....	1,061	July 18.....	44,956	Aug. 5.....	392
July 1.....	1,274	July 19.....	26,418	Aug. 6.....	431
July 2.....	3,534	July 20.....	16,109	Aug. 7.....	66
July 3.....	5,436	July 21.....	8,279	Aug. 8.....	35
July 4.....	4,630	July 22.....	8,349	Aug. 9.....	482
July 5.....	4,202	July 23.....	11,621	Aug. 10.....	123
July 6.....	4,127	July 24.....	9,553	Aug. 11.....	
July 7.....	57,237	July 25.....	9,916	Aug. 12.....	37
July 8.....	49,247	July 26.....	7,127		
July 9.....	38,741	July 27.....	2,589	Total.....	551,959
July 10.....	6,478	July 28.....	2,580		

A greater number of humpbacks entered Lake Aleknagik this season than during 1915, but the total would not materially affect the count. On July 9 a series of 20 counts showed about 3 humpbacks to each 100 fish passing through the rack. On July 22 a similar count gave an average of about 9 humpbacks to each 100 fish. Except when the three heavy runs were in progress, the salmon showing gill-net injuries were found to be slightly more numerous than during the preceding season. A number of red salmon having a wide fungoid stripe running from the dorsal fin to the tail were noted. At times the number of these diseased fish ranged from 1 to 7 for each 100 fish passing through the rack.

Operations at the rack, as heretofore, were made possible through the assistance rendered by the Alaska Packers Association and the

Alaska-Portland Packers' Association. The former furnished the entire equipment necessary for making the count, and the latter provided a tug for towing it to the lake. The Alaska Salmon Co. furnished a light skiff for use in making investigations on the lake.

#### ALEUTIAN ISLANDS RESERVATION.

The Aleutian Islands Reservation, which was created by an Executive order of March 3, 1913, includes all the islands of the Aleutian Chain, together with Unimak and Sannak Islands. The reservation is set apart as a preserve and breeding ground for native birds, for the propagation of reindeer and fur-bearing animals, and for the encouragement and development of the fisheries. These purposes, however, are not to interfere with the use of the islands for lighthouse, military, or naval uses or with the extension of the work of the Bureau of Education on Unalaska and Atka Islands. The reservation is jointly under the jurisdiction of the Departments of Agriculture and Commerce. The joint regulations effective March 15, 1914, promulgated by the two departments are still operative. Although the regulations provide that residents of the reservation desiring to engage in commercial fishing must first secure a permit, it is not the intention to require such permits from native residents of the reservation who take limited quantities of fish for local sale in addition to such fish as they may take for their own domestic purposes.

In 1916 six permits were issued for fishery operations in the Aleutian Islands Reservation. One of these was for the establishment of a cod-salting station on Tigalda Island; another was for the salting of salmon in the vicinity of Umnak Island; another related to the taking of Atka mackerel or greenlings in the vicinity of Attu Island and red salmon in the vicinity of Umnak Island; and the three remaining permits were for the operation of salmon canneries, one to be on Unalaska Island and the other two on the eastern end of Unimak Island. A feature of all permits is that in so far as possible employment must be given to native residents of the reservation. All permits have been made revocable at the pleasure of the Secretary of Commerce.

Since issuing these permits the Department has decided that on account of the small size of the streams to which salmon run within the reservation, and in view of the necessity of insuring a sufficient number of salmon for food for the natives, it will be necessary to withhold for a time the issuance of further permits for salmon-fishing operations.

**AFOGNAK RESERVATION.**

General supervision of fishing operations within the Afognak Reservation was exercised by Assistant Agent E. M. Ball. During June and July, Frank S. Morton patrolled the waters of the reservation, being assigned to this special detail from the Afognak hatchery.

Continuing the practice followed since the reservation was opened in 1912 to commercial fishing by the natives living therein, special rules were issued to assure greater protection to the more important streams of the island than is afforded by the general law and regulations. The streams at Malina and Paramanof were considered worthy of this special protection, in view of the fact that previously more salmon spawned in them than elsewhere about the island. Accordingly, a close season of five days at both places was established, Paramanof being closed from June 21 to 25, inclusive, and Malina from July 1 to 5. Litnik Bay was closed throughout the season.

In conformity with the terms of the Department's order of March 21, 1912, permits to fish in the waters of the reservation were granted upon application to 64 natives. About the end of May these natives repaired to the several streams of the island and dividing into gangs of from three to six men each waited for the appearance of the salmon. Malina and Paramanof were chosen by the greater number on account of larger catches at those places in previous seasons. In 1916, however, these streams attracted very few salmon, consequently the natives abandoned them and moved to other localities where the run was better. As a result of this elimination of the two important fields, operations at other places became congested by the influx of many more fishermen, and the catch of salmon per capita was correspondingly reduced.

The total catch of salmon from all streams of the island declined from 134,692 in 1915 to 73,181 in 1916. The greatest decline occurred at Malina and Paramanof, a result not wholly unexpected, as this was the fourth season after the volcanic disaster of 1912, when practically all salmon-spawning grounds on the west side of the island were temporarily ruined by the great fall of ashes from Mount Katmai. The stream at Little Afognak was the only one to show a considerable increase in production. In 1916 it yielded 53,582 salmon of all species, as against 21,971 in 1915, thus showing a gain of about 143 per cent. Furthermore, there was a marked change in the size of the salmon. Previously a large proportion of the red salmon taken at Little Afognak were undersized, two being counted as one, when sold by the fishermen. In 1916, however, there was a noticeable absence of the smaller fish. It is almost the unanimous opinion of the fishermen that the increased run of salmon in this region is the first unmistakable evidence of the beneficial effect of artificial propagation. Another striking circumstance observed at the Little



Afognak fishery was the prolonged season during which red salmon were taken. This species began running in June and continued without interruption until late in October.

The number of salmon taken from Afognak waters for commercial use in 1916 is shown, by localities and species, in the following table:

CATCH OF SALMON IN THE AFOGNAK RESERVATION, SEASON OF 1916.

Localities.	Kings.	Sockeyes.	Cohos.	Hump-backs.	Chums.	Total.
Malina.....	.....	2, 833	.....	1, 350	129	4, 312
Paramanof.....	.....	1, 697	.....	.....	.....	1, 697
Seal Bay.....	.....	6, 883	51	117	2	7, 053
Little Afognak.....	2	34, 898	16, 024	2, 658	.....	53, 582
Izhut Bay.....	.....	.....	998	.....	.....	998
Danger Bay.....	.....	.....	4, 194	1, 345	.....	5, 539
Total.....	2	46, 311	21, 267	5, 470	131	73, 181

The entire catch was sold to the Kodiak Fisheries Co., operating a cannery at Kodiak, for approximately \$2,700.

The following table shows the method of capture of each species and the approximate beginning and ending of the fishing season in each locality:

APPARATUS AND APPROXIMATE FISHING SEASON, AFOGNAK RESERVATION, 1916.

Localities.	Seined.					Sockeyes, gilled.	Fishing season.	
	Kings.	Sockeyes.	Cohos.	Hump-backs.	Chums.		Began.	Ended.
Malina.....	.....	2, 833	.....	1, 350	129	.....	June 15	July 7
Paramanof.....	.....	1, 697	.....	.....	.....	.....	do.....	Do.
Seal Bay.....	.....	6, 151	51	117	2	732	June 20	July 25
Little Afognak.....	2	33, 356	16, 024	2, 658	.....	1, 542	June 10	Oct. 20
Izhut Bay.....	.....	.....	998	.....	.....	.....	Aug. 10	Sept. 10
Danger Bay.....	.....	.....	4, 194	1, 345	.....	.....	Sept. 4	Sept. 20
Total.....	2	44, 037	21, 267	5, 470	131	2, 274	.....	.....

## ANNETTE ISLAND FISHERY RESERVE.

Upon representations made by the Secretary of the Interior, with a view to assisting the native residents of Annette Island, a presidential proclamation creating the Annette Island Fishery Reserve was issued April 28, 1916, as follows:

(ANNETTE ISLAND FISHERY RESERVE, ALASKA.)

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA.

## A PROCLAMATION.

Whereas it is provided by section fifteen, of the act of Congress, approved March third, eighteen hundred and ninety-one, entitled "An Act To repeal timber-culture laws, and for other purposes," that "Until otherwise provided by law, the body of lands known as Annette Islands, situated in the Alexander Archipelago in south-

eastern Alaska, on the north side of Dixon's entrance, be, and the same is hereby, set apart as a reservation for the use of the Metlakahtla Indians, and those people known as Metlakahtlans, who have recently emigrated from British Columbia to Alaska, and such other Alaskan natives as may join them, to be held and used by them in common, under such rules and regulations, and subject to such restrictions, as may be prescribed from time to time by the Secretary of the Interior," and

Whereas the Secretary of the Interior, with a view to assisting the Metlakahtlans to self-support, has decided to place in operation a cannery on Annette Island; and

Whereas it is therefore necessary that the fishery in the waters contiguous to the hereinafter-described group comprising the Annette Islands be reserved for the purpose of supplying fish and other aquatic products for said cannery:

Now, therefore, I, WOODROW WILSON, President of the United States of America, by virtue of the power in me vested by the laws of the United States, do hereby make known and proclaim that the waters within three thousand feet from the shore lines at mean low tide of Annette Island, Ham Island, Walker Island, Lewis Island, Spire Island, Hemlock Island, and adjacent rocks and islets, located within the area segregated by the broken line upon the diagram hereto attached and made a part of this proclamation, also the bays of said islands, rocks, and islets, are hereby reserved for the benefit of the Metlakahtlans and such other Alaskan natives as have joined them or may join them in residence on these islands, to be used by them under the general fisheries laws and regulations of the United States as administered by the Secretary of Commerce.

Warning is hereby expressly given to all unauthorized persons not to fish in or use any of the waters herein described or mentioned.

In witness whereof, I have hereunto set my hand and caused the seal of the United States to be affixed.

Done at the City of Washington this 28th day of April, in the year of our Lord one thousand nine hundred and sixteen, and of the Independence of the United States the one hundred and fortieth.

[SEAL.]

WOODROW WILSON.

By the President:

ROBERT LANSING,  
*Secretary of State.*

Under the terms of this proclamation it has been regarded that the rights of fishing within the reserved area were reserved to the native residents of the reservation. With a view to utilizing the fish thus taken from the waters of the reservation by the natives, the Department of the Interior entered into a lease on May 4, 1916, with P. E. Harris, of Seattle, to operate the cannery used formerly by the Metlakatla Industrial Co. This plant had not been in service for several seasons, and it was contemplated that extensive repairs would be made. Before the fishing season opened the building, while being repaired, was destroyed by fire May 17, and it was considered too late to rebuild in time to operate during the season of 1916.

In the spring of 1916, just prior to the promulgation of the proclamation creating the Annette Island Fishery Reserve, the Alaska Pacific Fisheries began the construction of a pound net or fish trap near Cedar Point just off the western side of Annette Island. The Government felt that this undertaking was an unauthorized invasion of the reservation, and the company was accordingly

requested to remove the structure. The company refused to do so, alleging that it had acquired vested rights in the net and that the proclamation had been issued without authority of law. Proceedings were instituted through the Department of Justice to cause the removal of the net. It was completed and fished for a few days, but on June 2 a temporary injunction was issued by Judge Brown of the United States district court, restraining the owners from using it. On July 7, Judge Jennings, of the same court, rendered a decree ordering the removal of the pound net and permanently enjoining the company from trespassing in or upon the waters of the reserve. Upon representations by the Alaska Pacific Fisheries the circuit court of appeals for the ninth circuit granted a supersedeas which allowed temporary operation of the pound net under bond. Near the end of the fishing season, on August 19, the court dissolved the supersedeas which it had issued. The Alaska Pacific Fisheries filed an appeal to the circuit court from the decree of the district court of July 7. On March 19, 1917, the court of appeals affirmed the decision of the lower court.

#### **INJURY TO SALMON BY BIRDS.**

Definite conclusions in regard to the effect upon the salmon supply caused by destruction of salmon fry and eggs by birds, especially gulls and terns, can not at present be formed. The making of accurate and reliable observations at the spawning grounds is attended with many difficulties. Such observations as have been made have been in connection with other work which demanded a large portion of the time of the employees concerned.

Observations made in regard to the habits of gulls on Afognak Island do not indicate that these birds are particularly destructive under ordinary conditions to salmon fry or eggs. Observations made in 1915 at the spawning grounds at Lake Aleknagik, Nushagak region, indicate that two of the principal enemies of the young salmon are gulls and terns. An examination of the stomachs of a number of these birds showed them filled with small salmon, the terns especially. The stomach of one tern contained six recently caught fry and a small quantity of partly digested fish.

The Bureau plans to continue investigations in 1917 in regard to the subject whenever opportunities are presented.

#### **THE COPPER RIVER FISHERY.**

In view of the unusual development of the Copper River salmon fishery in 1916, and as there are certain conditions peculiar to this stream which may have a most important bearing on the future of the fishery, it seems timely to review the situation at some length and make suggestions in regard to the best course to pursue in handling the matter.

The Copper River is a glacial stream about 300 miles long which empties into the Gulf of Alaska through a delta nearly 40 miles in width and extending upstream about 25 miles. Among its chief tributaries are the Klutina River, about 75 miles in length; the Chitina, approximately 100 miles long; and the Gulkana, some 80 miles in length.

For many years prior to 1915 the Copper River has been the scene of commercial fishing for salmon at the delta, and in a limited way there has been some salting of salmon above the delta. The Copper River & Northwestern Railway crosses the upper part of the delta about 20 miles out from Cordova and in a general way parallels the river to Chitina, 131 miles from Cordova. The railroad follows immediately along the river bank for a considerable part of this distance. The Copper River is unique in that it is the only stream in Alaska that supports a salmon fishery of any consequence entirely separate from and independent of coastal operations. In 1915 advantage was taken of the railroad facilities and a cannery was established at Abercrombie just above Abercrombie Canyon, 55 miles from Cordova and about 35 miles from the lower end of the delta. Fish were hauled to the cannery on the railroad from points along the river, and the finished product was transported in the same way to Cordova. The success of this undertaking attracted considerable attention to the region, and in 1916 there was a notable expansion of operations in the Copper River district. Prior to 1915 but one cannery had drawn on the river for its supply of salmon. In that year three canneries secured salmon from the stream, and in 1916 there were five canneries drawing in part or wholly upon that stream.

As a result of this expansion fishing was prosecuted with such vigor at certain localities as to occasion some concern regarding the effect it might have upon the future supply of salmon. This apprehension was stimulated somewhat by complaints of the Indians on the Copper River, presented through a representative of the Bureau of Education, to the effect that the unusual activity in fishing operations was causing a shortage in the supply of salmon used by the Indians for food. The native settlements, having a population of about 300 Indians, are well above the sections of the river where fishing for the canneries is carried on. In view of this condition, Assistant Agent James H. Lyman was directed to visit the upper waters and tributaries of the Copper River for the purpose of ascertaining, if possible, whether the complaints as to the scarcity of fish were justified and whether an examination would show that a sufficient number of salmon were reaching the spawning grounds to prevent any depletion in the future supply. This work was carried on in September, the particular waters visited being Long Lake tributary to

the Chitina River, Klutina Lake on Klutina River, the headwaters of the Gulkana River, and the Copper River proper north of Chitina. On account of the extent and inaccessibility of the territory involved, results were rather incomplete, but it appeared from such information as was obtained that comparatively few salmon escaped the commercial fishermen lower down the stream and reached the spawning grounds. In some measure these observations confirmed the testimony of local fishermen at Chitina and of Indians at various places.

Observations covering one season, however, are of little value unless they are considered with and are a part of a series of investigations extending over several years. In this connection certain facts and known conditions are worthy of consideration, as they relate to the vital question of the effect of commercial fishing upon the permanency and preservation of the fishery in this stream. Among these may be mentioned the size of the run, as indicated by the number of salmon caught during a given season; the opportunity of the salmon to escape and ascend to the spawning grounds; whether the stage of the river is high or low; and the amount of gear employed and its efficiency. Consideration must also be given to the weekly close period of 36 hours, which affords an opportunity for salmon to ascend, and there must also be taken into account those intervals of daily occurrence while the fishermen are resting or for other reasons when operations naturally cease, and, further, there must be considered those periods when fishing is seriously interrupted for days at a time on account of high water.

That part of the Copper River where commercial fishing is carried on extensively is herein considered in three sections—viz, the delta, Miles Lake, and Abercrombie Canyon. The lake is about 5 miles above the upper end of the delta and is merely a widening of the river along the face of Miles Glacier. It is a rectangular body of water about 4 miles long and 2 miles wide. The entire eastern shore and part of the north and south shores of the lake are formed by the glacier, where it is impossible to fish. About 6 miles of the shore line is available, where fishery operations may be conducted by means of anchored gill nets. The length of the nets used in 1916 varied from 50 to 80 fathoms each. At frequent intervals during the fishing season the lake is so filled with icebergs that operations are interfered with very seriously.

Not far above the lake the Copper River is confined by precipitous banks for a distance of about 2 miles to a channel varying from 450 to 600 feet in width, where the current runs very rapidly. This section of the river is known as Abercrombie Canyon. Fishing in the canyon is by means of hand dip nets, each about 16 inches in diameter. The fishermen select the most advantageous points along

the banks where there are eddies or where the current is not too strong. During the run of salmon dipping is carried on as steadily as conditions permit, although there are times when high water and sudden floods make it almost impossible to continue operations in the canyon. The fishermen dip blindly in the stream, the opening of the net sweeping downstream with the current. On account of the extremely turbid condition of the water the salmon can not be seen unless they rise to the surface, nor, on the other hand, are the fish able to observe the net. Sometimes many sweeps of the dip net produce no fish, but as many as five salmon have been taken at a single sweep of the net. One fisherman may dip as many as 1,000 salmon in a single day when the run is heavy.

In 1916 approximately 30,000 fathoms of gill nets were used at the delta and 5,000 at the lake, while 48 dip nets were operated in the canyon.

At the delta fishing for red and king salmon begins about the middle of May and continues until the middle of July, and for cohos and humpbacks operations extend from the first of July to the middle of September. At the lake and canyon fishing for red and king salmon begins the last of May and ends the last of July, while the coho season extends from the first of August to the end of September.

The following table shows, by localities and species, the approximate number of salmon taken from the Copper River in 1916:

CATCH OF SALMON FROM THE COPPER RIVER IN 1916.

Locality.	Kings.	Reds.	Cohos.	Hump-backs.	Total.
Delta.....	5,440	300,157	79,396	31,578	416,571
Lake <sup>a</sup> .....	3,440	279,504	25,120	.....	308,064
Canyon.....	5,325	128,476	10,914	.....	144,715
Total.....	14,205	708,137	115,430	31,578	869,350

<sup>a</sup> The catch of 15,826 reds and 3,637 cohos, a total of 19,463, gilled at mile 46, about 2 miles below the lake, and the 1,186 reds caught at mile 27 are included in the lake catch. Thus the actual lake catch was 277,415 salmon.

From the foregoing table it will be observed that operations about the delta produced nearly 48 per cent of the salmon taken from Copper River, while the lake yielded 35 per cent and the canyon nearly 17 per cent of the total take. The quantity of fishing gear was much greater at the delta than at the lake and canyon.

For the purposes of comparison it seems appropriate to record the Copper River catch for the years 1914 and 1915. In 1914 one cannery secured salmon from the delta as follows: Kings, 1,027; reds, 222,075; and cohos, 14,627. Also 1,730 kings were seined for mild-curing operations at the delta. At Abercrombie Canyon 240

kings were mild cured, and 60,000 reds were taken, chiefly by dip nets, for a saltery. The total catch in 1914 was 299,699 salmon of all species. In 1915 three canneries obtained salmon from the Copper River, the catch of two being from the delta, while that of the other was made at Miles Lake and Abercrombie Canyon. The catch of kings at the delta was 3,088 and the up-river catch was 3,828, a total of 6,916. The catch of reds at the delta was 196,922 and the catch upstream was 456,480, a total of 653,402. No cohos were taken at the delta, but 10,098 were caught up the river. Assembling these figures, the grand total of all species of salmon taken in 1915 at the delta and up river was 670,416.

To make further a matter of record the details of the salmon gilled at Miles Lake and caught by dip nets at the canyon in 1915, the following figures are noted:

CATCH OF SALMON IN THE COPPER RIVER ABOVE THE DELTA IN 1915.

	Gill nets.	Dip nets.
Kings.....	1,774	2,054
Reds.....	265,170	191,310
Cohos.....	10,098	

With respect to the complaints of the Indians, it may be said that as long ago as 1905, when but one cannery was in operation in the Copper River district, the same story of a shortage of food was heard and the same cry of the destruction of the salmon fishery was made as at present when five canneries are in the field, yet the Indians have lived through the intervening years and have had an ample supply of salmon whenever they made reasonable efforts to get it.

### SALMON HATCHERIES.

#### EXTENT OF OPERATIONS.

In 1916 fish-cultural operations were conducted at seven hatcheries in Alaska—two Government stations and five private hatcheries. One of the latter, the Karluk hatchery, was closed in the summer of 1916. Two small egg-collecting stations were also operated, the product of which was transferred to the Government hatchery at Afognak. The annual capacity of all hatcheries in Alaska is approximately 350,000,000 red-salmon eggs, of which the two Government stations can handle 150,000,000.

In 1915 the aggregate take of red or sockeye salmon eggs in Alaska was 171,627,100. In the corresponding report of Alaska Fisheries and Fur Industries for 1915 this number was stated to be 173,499,100, which was in error because of certain duplications in the returns from one of the stations which had not been discovered at that time.

The number of red or sockeye salmon liberated in Alaskan waters in the season of 1915-16 was 142,964,140, as compared with 121,784,330 in the previous season. The take of red-salmon eggs in 1916 totaled 171,566,000, or 61,100 less than in 1915. The Fortmann, Quadra, Klawak, and Afognak hatcheries show substantial gains for 1916, but the Yes Bay and Hetta hatcheries made smaller takes of red-salmon eggs in 1916. There was a notable increase in the number of humpback eggs secured in 1916, when the take aggregated 39,079,600, as compared with 16,976,000 in 1915, or a gain of 22,103,600 for 1916. The collections of humpback eggs in 1916 were made at Afognak station and its two subsidiaries, except for a very small take at Smeaton Bay in conjunction with the Yes Bay station.

#### OPERATIONS OF ALASKA HATCHERIES IN 1916.

Stations.	Red or sockeye salmon eggs taken in 1915.	Red or sockeye salmon liberated in 1915-16.	Red or sockeye salmon eggs taken in 1916.
Yes Bay.....	72,000,000	52,317,500	<i>a</i> 58,000,000
Afognak.....	<i>b</i> 6,353,000	<i>c</i> 22,933,640	<i>d</i> 17,044,000
Uganik.....	2,685,000		<i>e</i> 692,000
Seal Bay.....	3,232,100		<i>f</i> 4,678,000
Fortmann (Naha).....	26,520,000	25,055,000	62,580,000
Karluk.....	41,135,000	23,948,000	<i>g</i> 1,016,000
Quadra.....	<i>h</i> 7,408,000	7,092,000	16,125,000
Hetta.....	8,114,000	7,598,000	3,271,000
Klawak.....	<i>i</i> 4,180,000	4,020,000	8,160,000
Total.....	171,627,100	142,964,140	171,566,000

*a* A collection of 29,600 humpback-salmon eggs also made at Smeaton Bay.

*b* Through duplication in returns from the station, inadvertently indicated as 8,183,000 in 1915 Report of Alaska Fisheries and Fur Industries.

*c* Includes young red salmon resulting from eggs received from Uganik, Seal Bay, and Yes Bay.

*d* A collection of 25,310,000 humpback-salmon eggs also made.

*e* A collection of 10,730,000 humpback-salmon eggs also made. Of these, 409,000 were lost before the transfer to Afognak. All eyed eggs, both red and humpback salmon, transferred to Afognak.

*f* A collection of 3,010,000 humpback-salmon eggs also made. Of these, 130,000 were lost before the transfer to Afognak. All eyed eggs, both red and humpback salmon, transferred to Afognak.

*g* Operations discontinued June 30, 1916, except transfer of 1,016,000 eyed eggs to Afognak in August. These eggs were collected in June before the Karluk station was closed.

*h* Incorrectly reported previously by hatchery superintendent as 7,500,000, which number appeared in the Alaska Fisheries Report for 1915.

*i* Indicated as 4,130,000 in Alaska Fisheries Report for 1915, which number was subsequently modified by company.

NOTE.—Of the Yes Bay collections of sockeye eggs in 1915, shipment of 15,000,000 was made to Afognak, 3,000,000 to the Oregon Fish Commission, 50,000 to Quinault, Wash., and 50,000 to Anderson Lake, B. C. Of the 1916 collection of sockeye eggs at Yes Bay, 2,000,000 were sent in October to the Oregon Fish Commission.

A total of 16,000,000 humpback-salmon eggs were sent from the Afognak station to the Bureau's stations in the New England States and in Washington and Oregon, each region receiving 8,000,000 eggs.

#### HATCHERY REBATES.

Operators of private hatcheries in Alaska are allowed a rebate of 40 cents for every thousand red or king-salmon fry released. This is the equivalent of the Federal Government license tax on 10 cases of canned salmon. Recommendations have been made to Congress that this system be discontinued and that all hatcheries in Alaska be operated by the Government.

It is required by law that the operators of private hatcheries in Alaska make affidavit of the number of salmon fry released in each



fiscal year ended June 30. The following table shows the rebates due for the fiscal year ending June 30, 1916:

REBATES CREDITED TO PRIVATE SALMON HATCHERIES DURING THE FISCAL YEAR  
ENDED JUNE 30, 1916.<sup>a</sup>

Owners.	Location.	Red-salmon fry liberated.	Rebate due.
Alaska Packers Association.....	Naha Stream.....	25,055,000	\$10,022.00
Do.....	Karluk River.....	23,948,000	9,579.20
Northwestern Fisheries Co.....	Quadra Lake.....	7,092,000	2,836.80
Do.....	Hetta Lake.....	7,598,000	3,039.20
North Pacific Trading & Packing Co.....	Klawak Lake.....	4,020,000	1,608.00
Total.....		67,713,000	27,085.20

<sup>a</sup> In the case of hatcheries where the seasonal distribution of fry is not completed before July 1, the remaining fry are shown in the subsequent fiscal year's report.

It seems appropriate to make a matter of record a statement as reported March 28, 1916, by the Treasury Department of the amounts received from fishery taxes and the amount of hatchery rebates of taxes in Alaska for the last 10 years. The general fishery tax is collected by the clerks of the district court. This tax is handled through the Treasury Department in the Alaska fund, 65 per cent of which is available for roads and trails, 25 per cent for school purposes, and 10 per cent for the care of indigents in Alaska. The following statement has been submitted by the Treasury Department:

ALASKA FISHERY TAXES AND HATCHERY REBATES REPORTED BY TREASURY  
DEPARTMENT.

Year.	Cash.	Hatchery rebates.	Total.
1906.....	\$58,832.79	.....	\$58,832.79
1907.....	73,417.09	.....	73,417.09
1908.....	93,748.55	\$8,498.80	102,247.35
1909.....	57,664.24	7,110.40	64,774.64
1910.....	134,940.47	29,703.48	164,643.95
1911.....	88,390.50	35,434.08	123,824.58
1912.....	116,508.11	39,746.00	156,254.11
1913.....	127,709.17	59,464.24	187,183.41
1914.....	146,296.85	43,044.84	189,341.69
1915.....	166,253.81	18,937.40	185,191.21
Total.....	1,063,761.58	241,949.24	1,305,710.82

HATCHERY INSPECTION.

In order to secure a proper check upon the operations of the private hatcheries in Alaska, they have been inspected from time to time by representatives of the Bureau. It may be stated in a general way that the operation of most of these stations compares favorably with the work conducted at the Government hatcheries.

## HATCHERY OPERATIONS.

## YES BAY.

In September, 1915, a collection of 72,000,000 red-salmon eggs was made at the Bureau's station at Yes Bay, from which 52,319,500 fry were hatched. Of this number, 32,915,000 were liberated as fry in the winter of 1915-16 and 19,402,500 as fingerlings in 1916, there being a loss of 2,000 fingerlings. Shipments of eggs were made in October, 1915, as follows: Oregon Fish Commission, 3,000,000; Quinault Lake, Wash., 50,000; and Anderson Lake, British Columbia, 50,000. In the report of Alaska Fisheries and Fur Industries for 1915 it was indicated that 100,000 eggs were transferred to Quinault Lake, but in reality 50,000 of these were diverted at Seattle and sent to Anderson Lake. In November, 1915, a shipment of 15,000,000 red-salmon eggs was sent to the Afognak station. The total loss of eggs and fry at Yes Bay was 1,580,500, or a little more than 2 per cent.

Spawning operations at Yes Bay in 1916 began September 1 and ended October 2. During that period 58,000,000 red-salmon eggs were taken. From this collection 2,000,000 eggs were transferred in October, 1916, to the Bonneville, Oreg., station of the Oregon Fish Commission.

A temporary substation for the collection of humpback-salmon eggs was established at Smeaton Bay, but there was a very small run of humpbacks in that locality and only 29,600 eggs were obtained, which were planted on the near-by spawning beds.

The Bureau's efforts to rear salmon to fingerling size before planting were continued at Yes Bay, but facilities for holding the young fish are still too limited to admit of more than part of the station's output being carried beyond the fry stage. The young fish were fed on raw salt salmon ground up after being freshened. The results obtained from the use of this food were better than in 1915, when cooked salmon was used. It was also noted that the young fish thrived better in the hatching troughs than in the rearing ponds.

The usual patrol of Yes Bay was maintained during the run of red salmon in order to enforce the order closing those waters to commercial fishing.

## AFOGNAK.

In 1915 the collection of red-salmon eggs at Afognak was 6,353,000. In the Bureau's Alaska Fisheries and Fur Industries Report for 1915, it was inadvertently stated by reason of duplications in returns from the station that the take was 8,183,000. The collection in 1915 was augmented by the transfer of 2,600,000 eyed eggs from Uganik, 3,173,000 from Seal Bay, and 15,000,000 from the Bureau's station at Yes Bay, making a total of 27,126,000 red-salmon eggs handled at this station during the season of 1915-16. From this number

there were planted in the period from February to June, 1916, 11,833,200 fry and 11,100,440 red-salmon fingerlings, or a total of 22,933,640 young salmon.

The red-salmon spawning season of 1916 began July 28 and ended October 18, in which period 17,044,000 eggs were taken. This number was increased by the transfer in August of 1,016,000 eyed eggs from the Karluk hatchery of the Alaska Packers Association, 681,000 from Uganik, and 4,600,000 from Seal Bay in October, thus making a total of 23,341,000 red-salmon eggs incubated at Afognak in the winter of 1916-17.

In October and November, 1916, there were planted 1,401,000 fry hatched from these eggs, and at the end of December there remained on hand 7,200,000 eggs and 13,021,000 fry.

In 1916 the first humpback-salmon eggs were taken August 11 and the last on September 11. During that period 25,310,000 eggs were obtained, which is more than double the take of 1915, when 12,355,000 were collected. The transfer in October of 10,321,000 eyed eggs from Uganik and 2,820,000 from Seal Bay increased the total number handled at Afognak to 38,451,000. From this number a shipment of 16,000,000 eggs was made to the Bureau's stations in the New England States and in Washington and Oregon, each region receiving 8,000,000 eggs.

Plants of humpback-salmon fry in November and December aggregated 15,756,000, while 3,095,000 eggs were lost, leaving a balance of 3,600,000 eggs on hand at the end of the year. Additional plants of fry hatched from eggs collected in 1915 totaled 2,336,500, thus making a grand total of 18,092,500 young humpback salmon released at Afognak in 1916.

A matter which invites comment is the greatly lengthened red-salmon egg-collecting period each year since the eruption of Mount Katmai in 1912 as compared with the period of such operations prior thereto from the beginning of fish-cultural work on Afognak Island in 1908. That year the first red-salmon eggs were taken on July 27, the maximum take was made August 17, and the last eggs were collected on August 26. The spawning season covered a period of 31 days. This was the approximate length of each season to and including that of 1912. Beginning with 1913 there has been a marked variation from this condition. Although the first eggs secured in 1913 were taken July 31, about the usual time, the last collection was not made until October 10, the length of the season being 72 days, almost two and one-half times that of 1910, the shortest season on record at this station. After 1913 the seasons were much longer than they had been in previous years, culminating in 1916 in one of 83 days' length, beginning as it did July 28 and closing October 18.

OPENING AND CLOSING DATE AND LENGTH OF SPAWNING SEASON OF RED SALMON  
AT LITNIK LAKE, AFOGNAK ISLAND, ALASKA, SINCE THE HATCHERY WAS ESTAB-  
LISHED IN 1908.

Year.	First eggs taken—	Last eggs taken—	Length of season.
1908.....	July 27	Aug. 26	31 days.
1909.....	July 30	Aug. 31	33 days.
1910.....	do	Aug. 28	30 days.
1911.....	July 21	Sept. 2	44 days.
1912.....	July 27	Aug. 31	36 days.
1913.....	July 31	Oct. 10	72 days.
1914.....	Aug. 1	Sept. 29	60 days.
1915.....	Aug. 7	Sept. 30	55 days.
1916.....	July 28	Oct. 18	83 days.

UGANIK.

In 1916 there were collected at this field station 692,000 red and 10,730,000 humpback-salmon eggs, as compared with a take of 2,685,000 red and 2,461,000 humpback-salmon eggs in 1915. The loss of reds was 11,000 and of humpbacks 409,000, leaving 681,000 of the former and 10,321,000 of the latter as the number of eyed eggs transferred to Afognak in October. Some of the humpback-salmon eggs were later used in making up the shipment of 16,000,000 that was sent to Government hatcheries in the States.

The run of red salmon at Uganik in 1916 was very small, but a large number of humpbacks came to the stream, making it possible to have greatly increased the take of eggs of this species if the hatchery facilities had been adequate.

SEAL BAY.

The selection in 1915 of this place on the northeast coast of Afognak Island as an egg-collecting station was further justified in 1916 by the very gratifying increase in the take of eggs. Collections in 1915 aggregated 3,232,100 red and 1,235,000 humpback eggs, whereas in 1916 the take totaled 4,678,000 red and 3,010,000 humpback-salmon eggs. The taking of red-salmon eggs began August 18 and ended September 20. The first humpback-salmon eggs were taken August 18 and the last in the early part of September, when it became evident that the available hatching troughs could be filled easily in a short time with eggs of this species, leaving no space for the eggs of the more desirable red salmon that were ripening less rapidly. The spawning of humpbacks was therefore discontinued and operations were confined to the taking of red-salmon eggs until the troughs were filled. As no eggs were hatched at Seal Bay, and the losses amounted to 78,000 red and 190,000 humpback eggs, there were transferred to Afognak in October 4,600,000 red and 2,820,000 humpback-salmon eggs.

## FORTMANN.

This hatchery is owned and operated by the Alaska Packers Association. It is located on Heckman Lake, Revillagigedo Island, southeastern Alaska. The hatchery was first operated in the season of 1901-2, and it has been operated each season since. The capacity of the hatchery is approximately 110,000,000 red-salmon eggs. The Alaska Packers Association has recently adopted the incision method of taking eggs at this hatchery.

In 1915 there were taken 26,520,000 red-salmon eggs in the period from August 21 to November 20. From this take 25,055,000 young salmon were released in 1916 in the Naha stream system. The loss was 1,465,000, or 5.52 per cent. In the same season 600,000 hump-back-salmon eggs were taken at this hatchery for experimental purposes in the period from August 22 to November 22, 1915. From this take of eggs 560,000 fish were liberated in 1916. The loss was 40,000, or 6.66 per cent.

The take of red-salmon eggs in the period from August 22 to November 10, 1916, totaled 62,580,000. This is the largest take of eggs since the season of 1911-12 and the fourth largest in the history of the hatchery. The average number of eggs per female spawned was 2,932.

## KARLUK.

The take of red-salmon eggs at Karluk in the period from June 26 to September 29, 1915, was 41,135,000. From this take there were released 23,948,000 fry. The loss in eggs and fry was 17,187,000, or 41.8 per cent. In June, 1916, before it was decided to close the hatchery at the end of that month, more than a million red-salmon eggs were collected, from which 1,016,000 eyed eggs were transferred to the Afognak hatchery in August.

The Karluk hatchery was built by the Alaska Packers Association in 1896 and has been in operation each season since until closed in 1916. It is located at the upper end of Karluk Lagoon at the head of tidewater, a distance of about  $1\frac{3}{4}$  miles from Karluk Spit. In the period of its operation about 627,000,000 red-salmon eggs were taken, from which approximately 515,000,000 fry were hatched and liberated. Prior to the establishment of this station by the Alaska Packers Association fish-cultural work was undertaken in a limited way in 1891 by several companies engaged in canning operations at Karluk, who built a small hatchery near the site subsequently used by the Alaska Packers Association. This small hatchery, however, was operated only one season, the take being 2,500,000 red-salmon eggs, from which because of lack of suitable facilities and want of experience only about 500,000 fry were released.

## QUADRA.

This hatchery is owned and operated by the Northwestern Fisheries Co. and is located at Quadra in southeastern Alaska. Its capacity is about 21,000,000 red-salmon eggs. In 1915 the taking of eggs was begun August 9, and was continued to November 13. In this period 7,408,000 red-salmon eggs were taken. Between December 13, 1915, and June 30, 1916, the number of young salmon released aggregated 7,092,000. The loss of eggs was 316,000, or 4.2 per cent. The take of eggs at Quadra in 1915 was previously incorrectly reported by the superintendent to be 7,500,000, which number was indicated in the Alaska Fisheries and Fur Industries Report for that year.

For the season of 1916-17 the taking of eggs was begun August 9 and ended on November 19, 1916. The take of red-salmon eggs was 16,125,000.

## HETTA.

This hatchery is owned and operated by the Northwestern Fisheries Co. and is located on Hetta Lake near the southern end of Prince of Wales Island, southeastern Alaska. Its capacity is about 12,000,000 red-salmon eggs. For the season of 1915-16 the taking of red-salmon eggs was begun August 8, 1915, and was continued until late in December. The take of eggs was 8,114,000. Between August 15, 1915, and June 30, 1916, young salmon to the number of 7,598,000 were released. The loss of eggs for this season was 496,000, and in addition 20,000 young fish died, the total loss being 6.4 per cent.

For the season of 1916-17 the taking of eggs was begun August 21 and was completed December 20, 1916. The take aggregated 3,271,000 red-salmon eggs.

Further improvements were made in 1916 in respect to the condition of the water supplied to the hatchery. Arrangements were also made for installing in the winter of 1916-17 an additional retaining pond for fry.

## KLAWAK.

This hatchery is operated by the North Pacific Trading & Packing Co. It is located on a lake a few miles above Klawak, on the west coast of Prince of Wales Island, southeastern Alaska. Its capacity is approximately 10,000,000 red-salmon eggs. In 1915 the taking of red-salmon eggs was begun July 24 and was continued to November 9. In this period 4,180,000 eggs were taken. Upon the basis of the company's original statement this number was indicated to be 4,130,000 in the Alaska Fisheries and Fur Industries Report for 1915. A later statement showed the take to have been 4,180,000. From July 24, 1915, to April 7, 1916, the loss of eggs was 160,000, or 3.8

per cent. The number of fry hatched and liberated from the 1915 take of eggs was 4,020,000. The young salmon were liberated in the period between October 6, 1915, and April 7, 1916.

In the season of 1916-17 egg taking began on July 20 and continued through September 26, 1916. The take of red-salmon eggs was 8,160,000.

During the winter of 1915-16 the North Pacific Trading & Packing Co. blasted out certain sections of the falls at the foot of the lake upon which the hatchery is situated, and there is now a better overflow for the water and the channel for the ascent of fish is improved. It is reported that since this change has been made no damaged salmon have been taken, which was common before the improvement at the falls. Another improvement in the work of this station in 1916 was the adoption of the incision method for taking red-salmon eggs.

The young salmon at this hatchery are liberated chiefly well up in small streams tributary to the lake. Some of the fry are retained in the small pond at the hatchery, where they have been observed to be in excellent condition, but the pond is too small to accommodate any large number. The construction of a series of small ponds in a stream near the hatchery would add materially to present facilities.

#### GENERAL STATISTICS OF THE FISHERIES IN 1916.

In 1916 the total investment in the Alaska fisheries amounted to \$39,569,612, an increase of \$2,253,052 over 1915. Approximately 88 per cent of this investment was in the salmon industry. The number of persons engaged in 1916 was 23,994, an increase of 1,532 over 1915. The total value of the products in 1916 was \$26,156,559, an increase of \$5,157,216 over 1915. In both quantity and value of the products this is the largest output of the fisheries in the history of Alaska. It exceeds by \$4,913,584 the previous record of 1914, when the total value of the products was \$21,242,975.

#### SUMMARY OF INVESTMENTS IN THE FISHERIES OF ALASKA IN 1916.

Industries.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Salmon canning.....	\$12,730,402	\$6,326,029	\$15,044,422	\$34,100,853
Salmon pickling.....	78,040	80,975	181,872	340,887
Salmon mild-curing.....	519,580			519,580
Herring fishery.....	509,046			509,046
Halibut fishery.....	2,149,311			2,149,311
Cod fishery.....		564,212		564,212
Whale fishery.....	386,300		705,171	1,091,471
Clam canning.....		157,943		157,943
By-products.....	124,709			124,709
Shark fishery.....	11,600			11,600
Total.....	16,508,988	7,129,159	15,931,465	39,569,612

## SUMMARY OF PERSONS ENGAGED IN THE FISHERIES OF ALASKA IN 1916.

Races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Whites.....	5,479	1,748	5,222	12,449
Natives.....	3,336	757	700	4,793
Japanese.....	970	441	420	1,831
Chinese.....	1,088	375	908	2,371
Miscellaneous.....	399	310	1,841	2,550
Total.....	11,272	3,631	9,091	23,994

a Filipinos, Mexicans, Negroes, Porto Ricans, etc.

## SUMMARY OF PRODUCTS OF THE ALASKA FISHERIES IN 1916.

Products.	Quantity.	Value.
Salmon:		
Canned.....cases..	4,900,627	\$23,269,429
Mild-cured.....pounds..	3,920,400	397,628
Pickled.....barrels..	17,734	212,667
Fresh (including local).....pounds..	1,713,848	136,983
Frozen.....do.....	863,406	34,408
Dry salt, dried, and smoked backs.....do.....	60,622	3,723
Halibut:		
Fresh (including local).....do.....	5,672,118	407,422
Frozen.....do.....	5,724,023	268,319
Fletched.....do.....	68,958	2,368
Pickled and mild-cured.....do.....	30,458	1,354
Cod.....do.....	14,302,364	518,797
Herring.....do.....	6,839,200	216,640
Herring, canned.....cases..	19,850	132,330
Herring oil.....gallons..	188,926	47,231
Herring fertilizer.....tons..	875	21,875
Whale oil.....gallons..	717,500	291,500
Sperm oil.....do.....	90,500	29,750
Whale fertilizer.....pounds..	2,272,000	41,000
Whalebone.....do.....	1,873	1,471
Trout:		
Frozen.....do.....	50,822	3,647
Pickled.....barrels..	17	193
Canned.....cases..	530	3,095
Sablefish.....pounds..	304,141	11,185
Atka mackerel.....barrels..	27	270
Red rock cod.....do.....	45,200	1,294
Miscellaneous fresh fish, local.....do.....	116,667	9,333
Clams.....cases..	10,093	35,622
Shrimps.....pounds..	72,005	3,636
Shrimp fertilizer (shells).....do.....	8,880	114
By-products, oil.....gallons..	40,750	20,150
By-products, fertilizer and meal.....pounds..	1,438,000	27,775
Shark hides.....number..	450	4,000
Shark oil.....gallons..	2,700	1,350
Total.....		26,156,559

## SALMON INDUSTRY.

The salmon industry of Alaska presents each year certain noteworthy features which serve to distinguish one season from another and which give rise to valuable comparisons in the development of the fisheries of the Territory. Viewed thus it may be recorded that the total production of the salmon fisheries in Alaska in 1916 exceeded in quantity and value that of any other year. An important factor in this development was the increase in the number of canneries operated, the total number being 100, as compared with 85 in 1915.

In the southeastern district the output of the canneries shows that the pack of cohos was more than double that in 1915 and the largest



ever made; it shows the largest pack of chums in the history of the industry; the largest pack of humpbacks and kings save the season of 1915; and that the pack of reds was exceeded only by that of 1914. The mild-cure and frozen-salmon industries, which have their chief centers in southeastern Alaska, showed good gains over 1915. The fresh-salmon industry declined somewhat because of greater demands for canning purposes.

The events of largest moment in central Alaska were the tremendous run of humpbacks generally throughout the district and the particularly heavy run of red salmon at Karluk and the south end of Kodiak Island. The result was the largest pack of salmon ever made in central Alaska, the increase in this district over the previous high record of 1914 being more than 400,000 cases, made up chiefly of humpbacks, although there was a larger pack of all species except kings.

The western district of Alaska is the chief producer of red salmon. The season of 1916 shows a noteworthy increase over that of 1915. Beginning with 1912 the run of red salmon in western Alaska has been remarkably constant, and notwithstanding the lighter run of 1915 the average catch for the five seasons is 19,860,000. The approximate catch in 1916 was 19,600,000, which compares very favorably with the catch of 1913 and 1914, when approximately 21,500,000 were taken each season. The catch in 1916 was larger than in 1915 by about 3,000,000 red salmon. The salmon-pickling industry, which is confined chiefly to the western district, shows a substantial increase in the product as compared with 1915.

#### SALMON CATCH AND FORMS OF GEAR.

The principal kinds of fishing apparatus used in the salmon industry of Alaska are seines, gill nets, and pound nets. Purse and haul seines numbering 434 and aggregating 75,080 fathoms of webbing were operated in 1916. This is a gain of 72 over 1915, when 362 were used. Southeast Alaska is credited with an increase of 20, central Alaska with 17, and western Alaska with 35.

The total number of gill nets operated in the salmon industry was 3,051, of an aggregate length of 412,595 fathoms. Western Alaska leads with 1,986 gill nets, southeast Alaska is second with 560, while central Alaska takes last place with 505.

There were 306 driven and 67 floating pound nets, or a total of 373 pound nets operated in the salmon industry of Alaska in 1916, an increase of 89 over 1915. Of the aggregate number used, 188 driven and 67 floating pound nets, or a total of 255, were located in southeast Alaska, 94 driven pound nets were operated in central Alaska, and 24 driven pound nets in western Alaska. In 1916 the gains by districts were: Southeast Alaska, 51 driven and 19 floating

pound nets, a total of 70; central Alaska, 10 driven pound nets; and western Alaska, 9 driven pound nets.

Of the total of 373 pound nets used in Alaska in 1916, 38 were operated by independents, who sold their catch to various canneries. Of these 38 independent pound nets, 17 were in southeast Alaska and 21 in central Alaska.

Seines caught 36 per cent of the total number of salmon taken from Alaskan waters in 1916, pound nets 33 per cent, and gill nets 30 per cent, while the remaining 1 per cent was taken by lines and dip nets. In 1915 the catch by the respective forms of gear was: Pound nets 42 per cent, seines 29 per cent, gill nets 27 per cent, and 1 per cent by other appliances. Further comparison shows that in 1916 the catch by pound nets declined 9 per cent and that it increased 7 per cent by seines and 3 per cent by gill nets. The proportionate catches by districts is shown in the following table, according to the principal kinds of apparatus used:

PERCENTAGE OF SALMON CAUGHT IN EACH DISTRICT BY PRINCIPAL FORMS OF GEAR.

Apparatus.	Southeast Alaska.		Central Alaska.		Western Alaska.	
	1915	1916	1915	1916	1915	1916
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Seines.....	39	43	32	58	6	7
Pound nets.....	57	52	52	35	7	7
Gill nets.....	3	3	15	6	86	85

The total catch of salmon in Alaska in 1916 was 72,055,971, as compared with 63,537,244 in 1915, an increase of 8,518,727. Southeast Alaska shows a decline of 6,400,967 salmon, but this falling off is more than balanced by the gain of 10,181,902 in central and 4,737,792 in western Alaska. Considering the Territory as a whole in 1916, the catch of cohos exceeded that of the preceding season by 1,121,747; chums by 2,561,206; humpbacks by 911,569; kings by 69,773; and reds by 3,854,432.

So much has been said about the remarkable efficiency of pound nets as compared with seines that figures upon the basis of official returns for the season of 1916 may prove of interest. Considering Alaska as a whole, 434 purse and haul seines were operated, which caught 25,725,808 salmon, an average of 59,276 per seine. In the same season 373 pound nets were operated, which caught 23,982,614 salmon, an average of 64,296 per pound net. It will thus be seen that the difference in the average catch of the two forms of apparatus is only 5,020 salmon. This disproves the oft-repeated statement of certain persons, chiefly those engaged in the purse-seine fishery, that the pound net catches such enormous quantities of salmon that it is the form of fishing apparatus upon which full responsibility must

rest if there is any overfishing or depletion of the waters. As indicated in the foregoing, nearly 2,000,000 more salmon were caught by seines than by pound nets in Alaska waters in 1916.

SALMON TAKEN IN 1916, BY SPECIES AND APPARATUS, FOR EACH GEOGRAPHIC SECTION OF ALASKA.

Apparatus and species.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
<i>Seines:</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>
Coho, or silver.....	351,756	91,461	1,174	444,391
Chum, or keta.....	2,940,657	291,975	66,405	3,299,037
Humpback, or pink.....	9,430,269	6,675,794	180,609	16,286,672
King, or spring.....	7,184	1,052	25,412	33,648
Red, or sockeye.....	787,480	3,454,378	1,420,202	5,662,060
Total.....	13,517,346	10,514,660	1,693,802	25,725,808
<i>Gill nets:</i>				
Coho, or silver.....	228,093	184,390	286,800	699,283
Chum, or keta.....	173,859	4,336	1,279,600	1,457,795
Humpback, or pink.....	99,640	69,212	153,089	321,941
King, or spring.....	34,421	37,874	103,833	176,128
Red, or sockeye.....	501,712	936,446	17,527,212	18,965,370
Total.....	1,037,725	1,232,258	19,350,534	21,620,517
<i>Pound nets:</i>				
Coho, or silver.....	811,069	262,947	22,630	1,096,646
Chum, or keta.....	1,783,113	503,761	335,942	2,622,816
Humpback, or pink.....	12,400,932	2,264,386	534,032	15,199,350
King, or spring.....	21,299	42,967	22,199	86,465
Red, or sockeye.....	1,111,351	3,225,446	640,540	4,977,337
Total.....	16,127,764	6,299,507	1,555,343	23,982,614
<i>Lines:</i>				
Coho, or silver.....	202,097			202,097
Chum, or keta.....	1,066			1,066
King, or spring.....	379,154			379,154
Total.....	582,317			582,317
<i>Dip nets:</i>				
Coho, or silver.....		10,914		10,914
King, or spring.....		5,325		5,325
Red, or sockeye.....		128,476		128,476
Total.....		144,715		144,715
<i>Total:</i>				
Coho, or silver.....	1,593,015	549,712	310,604	2,453,331
Chum, or keta.....	4,898,695	800,072	1,681,947	7,380,714
Humpback, or pink.....	21,930,841	9,009,392	867,730	31,807,963
King, or spring.....	442,058	87,218	151,444	680,720
Red, or sockeye.....	2,400,543	7,744,746	19,587,954	29,733,243
Grand total.....	31,265,152	18,191,140	22,599,679	72,055,971

SALMON CANNING.

NEW CANNERIES.

Fifteen new canneries were operated in Alaska in 1916—eight in southeast, three in central, and four in western Alaska. They were as follows: Southeast Alaska—Auk Bay Salmon Canning Co., Auk Bay; Beegle Packing Co., Northland Packing Co., and J. L. Smiley & Co., Ketchikan; Sanitary Packing Co., George Arm; Seattle Packing Co., floating plant at Idaho Inlet; Tenakee Fisheries Co., Tenakee; and Union Bay Fisheries Co., Union Bay. Central Alaska—Clark-Graham Co., on Eyak River, near Cordova; Hoonah Packing Co., on Bering River, near Katalla; and the Carlisle Packing Co., Cordova.

Western Alaska—Bering Sea Packing Co., Herendeen Bay; Pacific American Fisheries, Unalaska Island; Red Salmon Canning Co., Naknek; and the Alaska Fishermen's Packing Co., on Kvichak Bay, the plant of the latter having been rebuilt to replace the one destroyed by fire before the beginning of operations in 1915.

The cannery at Gambier Bay, acquired in 1915 by the Hoonah Packing Co., but closed in 1914 and 1915, was operated in 1916. This apparent gain of one more cannery for 1916 was offset by the loss of the cannery of the Northwestern Fisheries Co., at Kenai, which was destroyed by fire before operations began, thus making a net increase of 15 canneries over 1915. As the cannery of the Metlakatla Industrial Co. was not operated in 1915 and was burned before canning began in 1916, it is not counted in the foregoing categories, thus the net increase is not affected by its omission. The G. W. Hume Co. made a small pack of salmon before its plant was destroyed by fire, and therefore it is counted as having operated in 1916. At Metlakatla, Edward Verney & Son packed by hand about 200 cases of salmon. This plant is not included in the list of canneries.

## CHANGES IN CANNERIES.

The Seldovia Salmon Co. discontinued business by the sale of its cannery at bankruptcy proceedings held in Seattle in March, 1916. The Columbia Salmon Co. was incorporated to take over and operate the cannery in 1916. The four canneries of the North Alaska Salmon Co. in western Alaska were acquired by Libby, McNeill & Libby. No change occurred in respect to the cannery of the St. Elias Packing Co., at Dry Bay, which, as for several seasons past, was not operated in 1916.

## CANNERIES OPERATED IN 1916.

During the year 1916 there were 54 canneries in operation in southeast Alaska, 19 in central Alaska, and 27 in western Alaska—a total of 100 canneries for the Territory.

## COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED, AND NUMBER OF POUND NETS OWNED BY EACH.

Names.	Canneries.	Location.	Pound nets.
<b>Southeast Alaska:</b>			
Alaska Fish Co.....	1	Waterfall.....	1
Alaska Pacific Fisheries.....	3	{Chilkoot.....	a 8
		{Chomly.....	b 8
		{Yes Bay.....	c 8
Alaska Packers Association.....	2	{Loring.....	d 9
Alaska Sanitary Packing Co.....	1	{Wrangell.....	e 6
Anacortes Fisheries Co.....	2	{do.....	5
Astoria & Puget Sound Canning Co.....	1	{Kasaan.....	6
Auk Bay Salmon Canning Co.....	1	{Shakan.....	4
Barnes, F. C., Co.....	1	{Excursion Inlet.....	5
	1	{Auk Bay.....	1
	1	{Lake Bay.....	f 4
a 2 floating.	c All floating.	e 5 floating.	
b 4 floating.	d 6 floating.	f 1 floating.	

## COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED, AND NUMBER OF POUND NETS OWNED BY EACH—Continued.

Name.	Canneries.	Location.	Pound nets.
<b>Southeast Alaska—Continued.</b>			
Beagle Packing Co.....	1	Ketchikan.....	2
Deep Sea Salmon Co.....	1	Ford Arm.....	a 8
Doyhof Fish Products Co.....	1	Scow Bay.....	.....
Fidalgo Island Packing Co.....	1	Ketchikan.....	7
George Inlet Packing Co.....	1	George Inlet.....	3
Harris, P. E., & Co.....	1	Hawk Inlet.....	10
Hidden Inlet Canning Co.....	1	Hidden Inlet.....	.....
Hoonah Packing Co.....	2	Gambier Bay.....	2
Hume, G. W., Co.....	1	Hoonah.....	b 17
Karheen Packing Co.....	1	Nakat Harbor.....	c 2
Lindenberger Packing Co.....	2	Karheen.....	2
Myers, Geo. T., & Co.....	1	J Craig.....	1
Northland Packing Co.....	1	Roe Point.....	b 6
North Pacific Trading & Packing Co.....	1	Chatham.....	6
		Ketchikan.....	2
		Klawak.....	.....
		Dundas.....	5
Northwestern Fisheries Co.....	4	Hunter Bay.....	a 2
		Quadra.....	3
		Santa Ana.....	a 1
Pacific American Fisheries.....	1	Excursion Inlet.....	17
Petersburg Packing Co.....	1	Petersburg.....	3
Pillar Bay Packing Co.....	1	Pillar Bay.....	3
Point Warde Packing Co.....	1	Point Warde.....	a 3
Pure Food Fish Co.....	1	Ketchikan.....	c 3
Sanborn-Cram Co.....	1	Burnett Inlet.....	a 5
Sanborn-Cutting Co.....	1	Kake.....	a 5
Sanitary Packing Co.....	1	George Arm.....	.....
Seattle Packing Co.....	1	Idaho Inlet.....	.....
Smiley, J. L., & Co.....	1	Ketchikan.....	3
Starr-Collinson Packing Co.....	1	Moir Sound.....	a 3
Straits Packing Co.....	1	Skowl Arm.....	.....
Sunny Point Packing Co.....	1	Sunny Point.....	1
Swift-Arthur-Crosby Co.....	1	Heceeta Island.....	.....
Taku Canning & Cold Storage Co.....	1	Taku Harbor.....	b 11
Tee Harbor Packing Co.....	1	Tee Harbor.....	9
Tenakee Fisheries Co.....	1	Tenakee.....	2
Thlinket Packing Co.....	1	Funter Bay.....	23
Union Bay Fisheries Co.....	1	Union Bay.....	.....
Ward's Cove Packing Co.....	1	Ward Cove.....	.....
Wiese Packing Co.....	1	Rose Inlet.....	2
Yakutat & Southern Railway Co.....	1	Yakutat.....	.....
<b>Central Alaska:</b>			
Alaska Packers Association.....	4	Alitak.....	2
		Chignik.....	3
		Kasilof.....	16
		Larsen Bay.....	.....
Canoe Pass Packing Co.....	1	Cordova.....	1
Carlisle Packing Co.....	1	do.....	2
Clark-Graham Co.....	1	Eyak River.....	.....
Columbia Salmon Co.....	1	Seldovia.....	7
Columbia River Packers' Association.....	1	Chignik.....	3
Copper River Packing Co.....	1	Abercrombie.....	.....
Deep Sea Salmon Co.....	1	Knik Arm.....	5
Fidalgo Island Packing Co.....	1	Port Graham.....	5
Hoonah Packing Co.....	1	Bering River.....	.....
Kadiak Fisheries Co.....	1	Kodiak.....	1
Libby, McNeill & Libby.....	1	Kenai.....	17
		Chignik.....	3
Northwestern Fisheries Co.....	3	Orca.....	.....
		Uyak.....	d 4
Pacific American Fisheries.....	1	King Cove.....	4
<b>Western Alaska:</b>			
Alaska Fishermen's Packing Co.....	2	Koggiung.....	.....
		Nushagak.....	.....
		Kvichak River (2).....	.....
Alaska Packers Association.....	8	Naknek River (3).....	.....
		Nushagak Bay (2).....	5
		Ugaguk River.....	.....
Alaska-Portland Packers' Association.....	1	Nushagak Bay.....	3
Alaska Salmon Co.....	1	Wood River.....	.....
Bering Sea Packing Co.....	1	Herendeen Bay.....	4

a All floating.

b 2 floating.

c 1 floating.

d The 4 pound nets credited to the Uyak cannery of the Northwestern Fisheries Co. were a part of the equipment of the company's cannery at Kenai which was destroyed by fire before canning operations began. Some of the fish were transferred to Uyak.

## COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED, AND NUMBER OF POUND NETS OWNED BY EACH—Continued.

Names.	Canneries.	Location.	Pound nets.
Western Alaska—Continued.			
Bristol Bay Packing Co.....	1	Kvichak Bay.....	
Columbia River Packers' Association.....	1	Nushagak Bay.....	
Midnight Sun Packing Co.....	1	Kotzebue Sound.....	3
Naknek Packing Co.....	1	Naknek River.....	
Nelson Lagoon Packing Co.....	1	Nelson Lagoon.....	6
North Alaska Salmon Co.....	4	Kvichak River (2).....	
Northwestern Fisheries Co.....	1	Nushagak Bay.....	
Pacific American Fisheries.....	2	Ugaguk River.....	
Red Salmon Canning Co.....	2	Nushagak.....	
		Makushin Bay.....	
		Port Moller.....	3
		Naknek.....	
		Ugashik River.....	

## STATISTICS.

The number of canneries in operation in Alaska in 1916 was 100 as compared with 85 in 1915. The total investment was \$34,100,853, an increase of \$2,818,528 over 1915. The increase in investment in southeast Alaska was \$962,118; in central Alaska, \$551,650; and in western Alaska, \$1,304,760.

In 1916 the canning industry gave employment to 19,240 persons, an increase of 1,499 over 1915, when 17,741 were employed. The following increases are noted: Whites, 1,140; Chinese, 181; Japanese, 225; and miscellaneous, 197. The number of natives employed was 244 less than in 1915, the falling off occurring in southeast and western Alaska; but in the central district there was a gain of about 50. Considering Alaska as a whole, it is noteworthy that more than 4,000 natives were employed in the salmon-canning industry.

The pack of canned salmon in 1916 was 4,900,627 cases, valued at \$23,269,429, which is an increase of 400,334 over the 4,500,293 cases packed in 1915 and an increase of \$4,616,414 over the \$18,653,015 value of the 1915 pack. The pack of 1916 is the greatest both as to quantity and value in the history of Alaska, the previous record as to quantity being that of 1915, while the greatest value previously recorded was that of 1914, when the pack was worth \$18,920,589, or \$4,348,840 less than that of 1916. A comparison of the pack with that of 1915 is as follows: Southeast Alaska declined from 2,549,212 to 2,214,280, a decrease of 334,932 cases; central Alaska advanced from 632,848 to 1,075,913 cases, an increase of 443,065; and western Alaska also advanced from 1,318,233 to 1,610,434 cases, an increase of 292,201 cases over the pack of 1915. Continuing the comparison, it is observed that the pack of cohos more than doubled, increasing from 124,268 to 261,909 cases, a gain of 137,641 cases; chums increased from 479,946 to 724,115 cases, a gain of 244,169 cases; and reds increased from 1,932,312 to 2,110,937 cases, an advance of 178,625

cases. Humpbacks fell off from 1,875,516 to 1,737,793 cases, a decrease of 137,723 cases; and kings went down from 88,251 to 65,873 cases, a decrease of 22,378 cases in 1916.

## INVESTMENT IN THE SALMON-CANNING INDUSTRY IN 1916.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Canneries operated.....	54	\$3,764,083	19	\$1,587,991	27	\$3,462,688	100	\$8,814,762
Working capital.....		4,505,058		2,083,650		6,284,941		12,873,649
Wages paid.....		2,219,105		1,313,497		2,642,596		6,175,198
Vessels:								
Power vessels over 5 tons.....	143	739,384	49	483,777	57	729,920	249	1,953,081
Net tonnage.....	2,757		1,587		4,501		8,835	
Launches under 5 tons.....	67	87,220	65	53,438	32	123,625	164	264,283
Sailing.....	11	183,745	8	284,210	39	932,954	58	1,400,909
Net tonnage.....	9,444		13,882		50,589		73,915	
Boats, sail and row.....	896	58,101	565	44,374	1,245	298,165	2,706	400,640
Lighters, scows, and house boats.....	316	148,062	184	113,595	172	191,089	672	452,746
Pile drivers.....	47	148,896	36	100,357	25	64,940	108	314,193
Apparatus:								
Haul seines.....	12	1,768	53	22,290	6	4,100	71	28,158
Fathoms.....	1,728		11,918		1,060		14,706	
Purse seines.....	292	121,465	12	4,800	6	14,726	310	140,991
Fathoms.....	52,279		2,900		1,500		56,679	
Gill nets.....	320	26,180	473	46,495	1,948	225,678	2,741	298,353
Fathoms.....	29,050		51,815		302,260		383,125	
Pound nets, driven.....	187	573,343	94	187,430	24	69,000	305	830,773
Pound nets, floating.....	67	152,992					67	152,992
Dip nets.....			50	125			50	125
Total.....		12,730,402		6,326,029		15,044,422		34,100,853

## PERSONS ENGAGED IN THE SALMON-CANNING INDUSTRY IN 1916.

Occupations and races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites.....	998	943	2,733	4,674
Natives.....	1,232	288	158	1,678
Chinese.....	52			52
Japanese.....	46	1		47
Miscellaneous a.....	22	5		27
Total.....	2,350	1,237	2,891	6,478
Shoresmen:				
Whites.....	1,272	544	1,266	3,082
Natives.....	1,517	401	456	2,374
Chinese.....	1,036	375	908	2,319
Japanese.....	878	438	410	1,726
Miscellaneous a.....	374	305	1,841	2,520
Total.....	5,077	2,063	4,881	12,021
Transporters:				
Whites.....	309	175	219	703
Natives.....	13	13	3	29
Chinese.....				
Japanese.....	5	2		7
Miscellaneous a.....	2			2
Total.....	329	190	222	741
Grand total:				
Whites.....	2,579	1,662	4,218	8,459
Natives.....	2,762	702	617	4,081
Chinese.....	1,088	375	908	2,371
Japanese.....	929	441	410	1,780
Miscellaneous a.....	398	310	1,841	2,549
Total.....	7,756	3,490	7,994	19,240

a Filipinos, Mexicans, Negroes, Porto Ricans, etc.

OUTPUT OF CANNED SALMON IN 1916.<sup>a</sup>

Product.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
Coho, or silver:	<i>Cases.</i>	<i>Value.</i>	<i>Cases.</i>	<i>Value.</i>	<i>Cases.</i>	<i>Value.</i>	<i>Cases.</i>	<i>Value.</i>
$\frac{1}{2}$ -pound flat.....	11,599	\$86,899	1,546	\$12,372	-----	-----	13,145	\$99,271
1-pound flat.....	2,127	12,673	6,064	30,725	-----	-----	8,191	43,398
1-pound tall.....	165,314	873,407	46,087	239,696	29,172	\$143,719	240,573	1,256,822
Total.....	179,040	972,979	53,697	282,793	29,172	143,719	261,909	1,399,491
Chum, or keta:	-----	-----	-----	-----	-----	-----	-----	-----
$\frac{1}{2}$ -pound flat.....	1,423	7,989	-----	-----	-----	-----	1,423	7,989
1-pound flat.....	505,196	1,685,315	64,396	204,429	153,100	522,867	722,692	2,412,611
Total.....	506,619	1,693,304	64,396	204,429	153,100	522,867	724,115	2,420,600
Humpback, or pink:	-----	-----	-----	-----	-----	-----	-----	-----
$\frac{1}{2}$ -pound flat.....	39,921	221,442	1,570	8,774	-----	-----	41,491	230,216
1-pound flat.....	4,253	16,999	10,543	40,193	-----	-----	14,796	57,192
1-pound tall.....	1,286,650	4,613,786	357,939	1,296,990	36,917	132,001	1,681,506	6,042,777
Total.....	1,330,824	4,852,227	370,052	1,345,957	36,917	132,001	1,737,793	6,330,185
King, or spring:	-----	-----	-----	-----	-----	-----	-----	-----
$\frac{1}{2}$ -pound flat.....	937	7,509	295	3,086	1,385	7,758	2,617	18,353
1-pound flat.....	1,038	6,161	2,766	14,232	-----	-----	3,804	20,393
1-pound tall.....	16,256	90,332	18,952	102,087	24,244	122,255	59,452	314,674
Total.....	18,231	104,002	22,013	119,405	25,629	130,013	65,873	353,420
Red, or sockeye:	-----	-----	-----	-----	-----	-----	-----	-----
$\frac{1}{2}$ -pound flat.....	33,246	335,407	29,121	282,346	19,198	190,149	81,565	807,902
1-pound flat.....	21,613	142,640	30,416	210,103	34,366	223,666	86,395	576,409
1-pound tall.....	124,707	737,793	506,218	3,029,854	1,306,046	7,600,262	1,936,971	11,367,909
2-pound nominal.....	-----	-----	-----	-----	6,006	13,513	6,006	13,513
Total.....	179,566	1,215,840	565,755	3,522,303	1,365,616	8,027,590	2,110,937	12,765,733
Grand total.....	2,214,280	8,838,352	1,075,913	5,474,887	1,610,434	8,956,190	4,900,627	23,269,429

<sup>a</sup> Cases containing  $\frac{1}{2}$ -pound cans have been reduced one-half in number and those containing 2-pound cans have been increased once in number. Thus, for the purpose of affording fair comparison, all are put upon the basis of forty-eight 1-pound cans per case.

OUTPUT OF CANNED SALMON, 1910 TO 1916.<sup>a</sup>

Product.	1910	1911	1912	1913	1914	1915	1916	Total.
Coho, or silver:	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>
$\frac{1}{2}$ -pound flat.....	163	1,574	2,719	3,587	4,579	2,050	13,145	27,817
1-pound flat.....	2,249	1,075	17	266	285	2,338	8,191	14,421
1-pound tall.....	111,614	131,259	163,462	71,926	152,199	119,880	240,573	990,913
Total.....	114,026	133,908	166,198	75,779	157,063	124,268	261,909	1,033,151
Chum, or keta:	-----	-----	-----	-----	-----	-----	-----	-----
$\frac{1}{2}$ -pound flat.....	-----	-----	2,795	985	373	-----	1,423	5,576
1-pound flat.....	-----	7,245	-----	2,619	5,568	317	-----	15,749
1-pound tall.....	254,218	316,550	661,838	287,314	657,918	479,629	722,692	3,380,159
Total.....	254,218	323,795	664,633	290,918	663,859	479,946	724,115	3,401,484
Humpback, or pink:	-----	-----	-----	-----	-----	-----	-----	-----
$\frac{1}{2}$ -pound flat.....	3,188	4,836	13,712	20,822	2,103	4,325	41,491	90,477
1-pound flat.....	7,900	9,437	-----	3,258	9,286	3,508	14,796	48,185
1-pound tall.....	543,233	991,005	1,266,426	1,348,801	974,660	1,867,683	1,681,506	8,673,314
Total.....	554,321	1,005,278	1,280,138	1,372,881	986,049	1,875,516	1,737,793	8,811,976
King, or spring:	-----	-----	-----	-----	-----	-----	-----	-----
$\frac{1}{2}$ -pound flat.....	54	67	5,151	1,585	3,143	2,404	2,617	15,021
1-pound flat.....	-----	-----	-----	-----	4,804	3,755	3,804	12,363
1-pound tall.....	40,167	45,451	38,166	32,785	40,092	82,092	59,452	338,205
Total.....	40,221	45,518	43,317	34,370	48,039	88,251	65,873	365,589
Red, or sockeye:	-----	-----	-----	-----	-----	-----	-----	-----
$\frac{1}{2}$ -pound flat.....	22,320	13,601	28,024	29,041	53,825	52,033	81,565	280,409
1-pound flat.....	39,941	4,967	16,242	11,735	64,671	112,847	86,395	336,798
1-pound tall.....	1,388,006	1,296,750	1,856,089	1,924,461	2,083,147	1,765,139	1,936,971	12,250,563
1 $\frac{1}{2}$ -pound nominals.....	-----	-----	-----	-----	-----	2,293	-----	2,293
2-pound nominals.....	-----	-----	-----	-----	-----	-----	6,006	6,006
Total.....	1,450,267	1,315,318	1,900,355	1,965,237	2,201,643	1,932,312	2,110,937	12,876,069
Grand total.....	2,413,053	2,823,817	4,054,641	3,739,185	4,056,053	4,500,293	4,900,627	26,488,269

<sup>a</sup> The number of cases shown has been put upon the common basis of forty-eight 1-pound cans to the case.



AVERAGE ANNUAL PRICE PER CASE OF FORTY-EIGHT 1-POUND CANS OF SALMON,  
1906 TO 1916.

Product.	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916
Coho, or silver.....	\$3.63	\$3.91	\$3.98	\$4.07	\$4.89	\$5.67	\$4.44	\$3.45	\$4.39	\$4.31	\$5.34
Chum, or keta.....	2.87	2.97	2.53	2.28	3.04	3.72	2.37	2.21	3.37	2.59	3.34
Humpback, or pink.....	3.00	3.16	2.69	2.40	3.15	3.94	2.55	2.58	3.50	2.78	3.64
King, or spring.....	3.78	4.18	4.20	4.32	5.34	6.48	5.37	4.04	5.01	4.63	5.36
Red, or sockeye.....	3.77	4.59	4.52	4.53	5.30	6.33	5.45	4.54	5.58	5.82	6.04

## FISHING SEASON.

It is regarded as a matter of interest to record the beginning and end of the fishing season in the canning industry for salmon in certain of the more important waters of the various regions of Alaska in the year 1916. The dates given in the table were taken from the statistical reports made by the canning companies, the earliest one reported by any company doing much fishing being accepted as an opening date, while the closing date was determined by taking the day nearest to which major operations ceased. The following table conveys this information:

## FISHING SEASON IN THE CANNING INDUSTRY FOR SALMON CAUGHT IN CERTAIN IMPORTANT WATERS IN ALASKA IN 1916.

Locality.	Coho.		Chum.		Humpback.	King.	Red.
	Fishing began—	Fishing ended—	Fishing began—	Fishing ended—	Fishing began—	Fishing ended—	
Southeast Alaska:							
Chatham Strait.....	June 1	Sept. 27	June 1	Sept. 30	June 1	Sept. 30	June 1
Prince of Wales Island, west side.....	June 15	Sept. 23	July 1	do.	July 1	do.	June 15
Cordova Bay.....	do.	do.	do.	do.	June 15	do.	do.
Clarence Strait—							
Southern section.....	June 10	Sept. 23	June 27	Sept. 29	June 27	Aug. 16	June 8
Northern section.....	July 20	Sept. 30	Aug. 13	Oct. 17	Aug. 17	Oct. 17	July 13
Behm Canal.....	June 15	Oct. 20	June 15	Oct. 20	June 15	Oct. 20	June 15
Revoligeddo Channel.....	June 27	Sept. 23	June 27	Sept. 23	June 27	Sept. 23	June 27
Stephens Passage.....	July 4	Oct. 3	June 22	Oct. 3	June 22	Sept. 21	June 27
Peril and Summer Straits.....	June 24	Sept. 27	July 1	Sept. 30	June 21	Sept. 30	June 27
Frederick Sound.....	June 22	Sept. 21	Sept. 14	Sept. 23	June 1	Sept. 27	June 22
Icy Strait and Cross Sound.....	June 15	Sept. 20	May 29	Sept. 27	June 1	Sept. 27	May 21
Lynn Canal.....	July 7	Oct. 1	July 7	Oct. 1	July 7	Aug. 24	June 24
Baranof Island, west side.....	July 4	Sept. 20	June 20	Sept. 20	June 20	Sept. 20	June 8
Chicagof Island, west side.....	Aug. 15	Sept. 15	Aug. 5	Sept. 15	Aug. 1	Sept. 15	Aug. 1
Portland Canal.....	Aug. 16	Sept. 9	July 8	Sept. 3	July 8	Sept. 3	July 8
Iphigenia Bay.....	June 8	do.	do.	do.	June 8	Sept. 9	June 8
Yakutat Bay.....	Aug. 25	Sept. 28	do.	do.	July 15	Aug. 10	June 2
Central Alaska:							
Bering River.....	do.	do.	do.	do.	do.	do.	do.
Martin River.....	do.	do.	do.	do.	do.	do.	do.
Copper River.....	May 12	Sept. 24	May 12	Sept. 24	May 12	Sept. 24	June 6
Copper River Delta.....	May 31	Sept. 16	May 31	Sept. 16	May 31	Sept. 16	May 12
Copper River, lake and canyon.....	Aug. 24	Sept. 25	May 31	Sept. 16	May 31	Sept. 16	May 12
Controller Bay.....	Aug. 24	Sept. 25	May 31	Sept. 16	May 31	Sept. 16	May 12
Cook Inlet.....	July 2	Aug. 27	June 24	Aug. 23	June 27	Aug. 8	May 31
Prince William Sound—							
Eastern section.....	July 1	Sept. 30	June 23	Sept. 24	June 28	Sept. 24	June 27
Western section.....	do.	do.	July 7	Aug. 4	July 9	Aug. 1	June 17
Aornek streams—							
Western part.....	Aug. 15	Oct. 20	Aug. 15	Oct. 20	Aug. 15	Oct. 20	June 15
Eastern part.....	June 3	Oct. 2	June 3	Oct. 2	June 3	Oct. 2	June 3
Karluk.....	do.	do.	do.	do.	do.	do.	do.
Red River.....	Aug. 15	Oct. 10	June 8	Sept. 1	June 8	Sept. 1	June 8
Uganik.....	June 8	Sept. 1	June 12	Sept. 8	June 12	Sept. 8	June 12
Onga Bay.....	June 28	Sept. 9	May 22	Sept. 25	May 22	Sept. 25	June 28
Chignik Bay.....	May 23	Aug. 15	June 23	Aug. 15	June 23	Aug. 15	May 23
Ikatan Bay.....	June 28	Aug. 11	June 9	Aug. 11	June 9	Aug. 11	June 28
Cold Bay, Rhin Point, and King Cove.....	June 9	Aug. 11	June 9	Aug. 11	June 9	Aug. 11	June 9
Morzinoor Bay.....	do.	do.	do.	do.	do.	do.	do.
Pavlov Bay.....	do.	do.	do.	do.	do.	do.	do.

[illegible]

## LOSSES AND DISASTERS IN THE SALMON-CANNING INDUSTRY.

Three disastrous fires occurred during the year, each of which destroyed a cannery and considerable other property. The first of these happened on May 17, when the cannery of the Metlakatla Industrial Co. on Annette Island was burned. This plant was owned by the natives of Metlakatla, who had leased it to P. E. Harris & Co., of Seattle. New machinery was to be installed by the company to bring the plant down to date, but fortunately none of it had been received at the cannery before the fire. A considerable quantity of gear was lost, however.

On May 22 the cannery of the Northwestern Fisheries Co. at Kenai was burned. Fire broke out about midnight in the can loft, and before it could be gotten under control the cannery and adjoining warehouses in which were stored cans for the season's pack and all new webbing for traps had burned. The superintendent's residence, several other small buildings, and most of the floating equipment were undamaged. The losses were approximately \$190,000. As it was impossible to rebuild the cannery in time to operate during the season of 1916, all oriental laborers returned to Seattle. Most of the regular outside men remained at Kenai during the summer, clearing away the débris and laying the foundation for new buildings which will be erected early next season.

The last large fire of the season occurred on June 26 and destroyed the cannery of the G. W. Hume Co. at Nakat Harbor. The plant was valued at about \$30,000 and the material and supplies for the operations of the season were worth \$50,000, making a total loss of about \$80,000.

The wharf of the North Pacific Trading & Packing Co. at Klawak was damaged by ice to the extent of \$2,500.

The loss of fishing gear for the several districts was approximately \$27,400. The Alaska Sanitary Packing Co. and the Canoe Pass Packing Co. lost one trap each. The Tee Harbor Packing Co. reported the loss of four traps, valued at \$12,000.

The Hoonah Packing Co. lost a launch in southeast Alaska, valued at \$1,200, and the Deep Sea Salmon Co. lost one on Cook Inlet having a book value of \$2,500. Other losses of small boats and scows aggregated \$3,250.

Three fishermen and one transporter were accidentally killed while engaged in salmon fishing in southeast Alaska. One shoresman was drowned in central Alaska, and five fishermen, two shoresmen, and one transporter were drowned in western Alaska, while two shoresmen met accidental death otherwise in the same district.

The Alaska Fishermen's Packing Co. reported the loss at its Nushagak cannery of 2,060 cases of red salmon, valued at \$7,828.

The steamer *Pavlof*, belonging to the Pacific American Fisheries, struck an uncharted rock off the south end of Kodiak Island on February 17 and lost her propeller. A wireless call for assistance was sent to Kodiak, and in response thereto the power schooner *Hunter* sailed immediately to the relief of the distressed vessel. Before the schooner reached the steamer a hard wind from the north drove her ashore on Tagidak Island, where she became a total loss. The *Pavlof* was engaged in transporting material to Herendeen Bay, western Alaska, where a new cannery was to be built.

#### MILD CURING OF SALMON.

The continuance of the war through 1916 made it impossible to ship mild-cured salmon to Germany, which in normal times has been the chief market for this product. This state of affairs caused a pronounced conservatism upon the part of producers, as they were at a loss to know to just what extent conditions warranted a pack over and above the requirements of the domestic market. It is noteworthy, however, that more recent reports show a growing demand for mild-cured salmon in those European countries of which the markets are not closed on account of the war and that there is also a stronger call for this product in the United States. The result has been reassuring, and conditions now indicate that the mild-cure industry will soon resume its normal proportions.

The mild-cure industry of Alaska in 1916 was centered almost wholly in the southeastern district. No salmon were mild cured in the central district, while in the western district only 12 tierces were packed. The principal operators were the Columbia & Northern Fishing & Packing Co. and the Dalmeny Fish Co., at Wrangell; Ferguson & Reichwein, at Craig; Hunter & Dickinson, at Washington Bay; Pacific Mild-Cure Co., at Hoonah, Port Conclusion, Taku River, Tyee, and Waterfall; Vendsyssel Packing Co., at Tyee and Klawak; and the Northland Trading & Packing Co., at Saginaw Bay and Port Alexander.

The firm of Engelbr. Wiese (Inc.), which for a number of years had taken a leading position in the mild-cure industry of Alaska, was dissolved in the spring of 1916, and its business was transferred to the Pacific Mild-Cure Co.

The most important salmon-trolling grounds in the mild-cure industry have been in the waters near Port Conclusion, in the vicinity of Noyes Island and about Forrester Island. The last-named island is a Federal bird reserve under the jurisdiction of the Department of Agriculture. Game Warden Willett of the Bureau of Biological Survey of that Department had charge of affairs on the island. It was reported that at no time were there more than 200 fishermen camped on the island. During the early part of the sum-

mer the whites and natives were quite evenly divided, but by the 1st of July most of the natives had left to work in the canneries, leaving only about 75 whites on the island. The fishing season was poor, only part of the rowboat trollers making a little more than expenses and the power-boat trollers not doing much better. At one time in the season nearly 100 power boats were anchored off the island. A number of the fishermen filed a complaint with the Biological Survey that some of the birds, notably the puffins, interfered very seriously with fishing operations by frequently taking the bait from the hooks.

There was a decrease of one in the number of fixed plants operated, but the investment increased from \$487,359 in 1915 to \$519,580 in 1916. The number of persons employed in 1916 was 1,793, an increase of 68 over 1915. A pack of 4,745 tierces of king salmon, 49 tierces of cohos, and 104 tierces of chums, a total of 4,898 tierces, was made in 1916, as compared with 2,713 tierces of kings and 68 tierces of cohos, a total of 2,781 tierces, in 1915, or a net increase of 2,117 tierces. The value of the pack in 1916 was \$397,628, as against \$191,523 in 1915, the increase in value being \$206,105. The pack of 1915 was unusually small.

#### INVESTMENT IN THE SALMON MILD-CURING INDUSTRY IN 1916.

Items.	Southeast Alaska.		Items.	Southeast Alaska.	
	No.	Value.		No.	Value.
Fixed plants.....	12	\$75,805	Gear:		
Operating capital.....		142,924	Seines, purse.....	1	\$80
Vessels:			Fathoms.....	80	
Power vessels over 5 tons.....	15	54,975	Gill nets.....	220	24,000
Net tonnage.....	237		Fathoms.....	23,000	
Launches under 5 tons.....	390	173,600	Troll lines.....	3,174	16,948
Boats, sail and row.....	1,011	27,915	Total.....		519,580
Sailing.....	1	1,233			
Net tonnage.....	14				
Lighters and scows.....	2	1,100			
House boats.....	1	1,000			

#### PERSONS ENGAGED IN THE SALMON MILD-CURING INDUSTRY IN 1916.

Occupations and races.	Southeast Alaska.	Occupations and races.	Southeast Alaska.
Fishermen:		Shoresmen:	
Whites.....	1,128	Whites.....	95
Natives.....	512	Natives.....	4
Total.....	1,640	Total.....	99
		Transporters: Whites.....	54
		Grand total.....	1,793

## PRODUCTS OF THE SALMON MILD-CURING INDUSTRY IN 1916.

Species.	Tierces.	Pounds.	Value.
Southeast Alaska:			
King salmon.....	4, 733	3, 786, 400	\$388, 248
Coho salmon.....	49	41, 200	2, 420
Chum salmon.....	104	83, 200	5, 880
Total.....	4, 886	3, 910, 800	396, 548
Western Alaska: King salmon.....	12	9, 600	1, 080
Grand total.....	4, 898	3, 920, 400	397, 628

## SALMON PICKLING.

The salmon-pickling industry in Alaska in 1916, when compared with similar operations in 1915, shows only slight increase in investment and number of salteries operated. The central district leads with 11, a gain of 3 over 1915; the western district has 7, a decline of 2 from 1915; and the southeastern district has 2, which are new this year. The total number in operation in 1916 was 20, as compared with 17 in 1915. The investment in 1916 was \$340,887, which is an increase of \$4,275 over 1915. The number of persons engaged declined from 329 in 1915 to 277 in 1916.

Practically two-thirds of this product is red salmon and comes from western Alaska. A considerable part of this business is conducted in an incidental way by the companies engaged in canning salmon. The entire production of pickled salmon in Alaska in 1916 was 17,734 barrels, valued at \$212,667, an increase of 4,441 barrels in quantity and \$64,027 in value over the pack of 1915. The average value per barrel indicated by these figures was approximately \$12 for 1916 and about \$11.18 for 1915.

## INVESTMENT IN THE SALMON-PICKLING INDUSTRY IN 1916.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Salteries.....	2	\$16, 325	11	\$19, 900	7	\$44, 637	20	\$80, 862
Operating capital.....		31, 880		39, 400		51, 000		122, 280
Vessels:								
Power vessels over 5 tons.	1	20, 000	5	13, 000	3	26, 000	9	59, 000
Net tonnage.....	112		73		140		325	
Launches under 5 tons...	1	1, 650	4	2, 500	3	5, 800	8	9, 950
Sailing.....			1	800	4	37, 500	5	38, 300
Net tonnage.....			20		1, 427		1, 447	
Boats, sail and row.....	17	905	35	1, 635	51	7, 785	103	10, 325
Lighters and scows.....	2	1, 350	2	300	6	4, 400	10	6, 050
Gear:								
Haul seines.....	1	100	9	1, 160	31	1, 250	41	2, 510
Fathoms.....	150		880		1, 550		2, 580	
Purse seines.....	3	2, 000	1	100			4	2, 100
Fathoms.....	450		80				530	
Gill nets.....	20	725	32	2, 040	38	3, 500	90	6, 265
Fathoms.....	875		1, 940		3, 655		6, 470	
Lines.....	36	605	8	140			44	745
Pound nets, driven.....	1	2, 500					1	2, 500
Total.....		78, 040		80, 975		181, 872		340, 887

## PERSONS ENGAGED IN THE SALMON-PICKLING INDUSTRY IN 1916.

Occupations and races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites.....	15	14	74	103
Natives.....		34	19	53
Total.....	15	48	93	156
Shoresmen:				
Whites.....	6	3	77	86
Natives.....		3	6	9
Total.....	6	6	83	95
Transporters:				
Whites.....	12	4		16
Natives.....		5	5	10
Total.....	12	9	5	26
Grand total.....	33	63	181	277

BARRELS <sup>a</sup> OF SALMON PICKLED IN 1916, BY SPECIES.

Product.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Coho, or silver.....	1,832	\$19,157	242	\$3,107	2	\$23	2,076	\$22,287
Coho bellies.....			27	500			27	500
Chum, or keta.....			7	56	488	4,001	495	4,057
Chum bellies.....	126	1,004	159	2,552			285	3,556
Humpback, or pink.....	286	2,405	172	840	45	379	503	3,624
Humpback bellies.....			61	882			61	882
King, or spring.....	354	4,777	36	436	246	2,743	636	7,956
King bellies.....			2	23			2	23
Red, or sockeye.....	55	642	1,914	27,955	11,580	139,185	13,549	167,782
Red bellies.....			100	2,000			100	2,000
Total.....	2,653	27,985	2,720	38,351	12,361	146,331	17,734	212,667

<sup>a</sup> Barrels holding 200 pounds of fish.

## SALMON FREEZING.

In 1916 seven companies engaged in the freezing of salmon in Alaska, though largely incidental to other business. They were the Columbia & Northern Fishing & Packing Co., at Wrangell; Booth Fisheries Co., at Sitka; Juneau Cold Storage Co., at Juneau; Taku Canning & Cold Storage Co., at Taku Inlet; New England Fish Co. and Washington Fish & Oyster Co., at Ketchikan; and the Glacier Fish Co., which operated a cold-storage plant on the barge *Glory of the Seas*, at Scow Bay.

The total quantity of salmon frozen was 863,406 pounds, valued at \$34,408, thus showing an increase over 1915 of 142,615 pounds in quantity and \$7,132 in value.

## SALMON FROZEN IN ALASKA IN 1916.

Species.	Pounds.	Value.
Coho salmon.....	266,696	\$10,783
Chum salmon.....	246,677	5,156
Humpback salmon.....	15,029	298
King salmon.....	323,718	17,788
Red salmon.....	11,286	383
Total.....	863,406	34,408



## FRESH-SALMON TRADE.

The trade in fresh salmon declined somewhat from that reported in 1915. This was probably due to the greater demand for all species of salmon at the canneries. Customs records at Juneau show that 1,480,515 pounds of fresh salmon, valued at \$118,316, were shipped from Alaska in 1916, as compared with 2,216,603 pounds, valued at \$172,268, in 1915. These fish were boxed in crushed ice and transported by the regular steamship lines. The companies handling the greater part of the fresh salmon in Alaska were the Columbia & Northern Fishing & Packing Co. and the Dalmeny Fish Co., at Wrangell, and the Washington Fish & Oyster Co., at Ketchikan.

The local fresh-fish trade is also of importance. Although detailed figures for this business have not been compiled, close estimates place the quantity at 700,000 pounds, valued at \$56,000. Of this, approximately one-half is halibut, one-third salmon, and the remainder miscellaneous species, including black cod, herring, eulachon, and bass.

## DRYING AND SMOKING OF SALMON.

The drying and smoking of salmon is an industry that attracts but few operators, most of whom engage in it as a side issue. The constant demand for dried salmon as food for dogs and foxes would seem to assure good prices for the product and tend to establish the business on a firmer basis. There have been some discouragements, however, because of extended periods of dampness and rain, involving the risk of losing the fish before curing is complete. The capital invested in the business is small, and several of the establishments are of temporary construction, often used only one season. The plant having greatest permanency is the one at Seldovia, owned by Nordyke & Markle, and valued at \$1,000. Arthur McConahay's plant at Three Mile Creek, on the western shore of Cook Inlet, probably represents an equal investment. Nordyke & Markle dried and smoked 8,070 pounds of humpback salmon, valued at \$625, and 4,430 pounds of chum salmon, valued at \$343. Linder & Olsen, at Dogfish Bay, Cook Inlet, dried 12,000 pounds of chum salmon, valued at \$600. Johnson & Howitson, at Cold Bay, dried 9,000 pounds of humpbacks, valued at \$450, and 10,000 pounds of red-salmon backs, valued at \$500. The natives of Tatitlik cured 5,122 pounds of humpbacks, having a value of \$205. Arthur McConahay, at Three Mile Creek, and T. D. Giezentanner, at Point Possession, on Cook Inlet, each smoked about 3 tons of salmon, having a total value of \$1,000.

During the winter of 1915-16 dried salmon sold in Anchorage, Alaska, at 25 cents per pound, while the minimum price did not fall below 10 cents.

Accurate statistics of the quantity of salmon dried on the Yukon River and tributaries are not obtainable, but there is quite a catch, chiefly by small wheels, which is prepared as dog feed and finds ready sale at the interior towns of Alaska. The natives of the Bristol Bay region also dry large quantities of salmon for local use.

#### SALMON BY-PRODUCTS.

One of the most meritorious lines of work carried on in connection with the fishery industry of Alaska is the utilization of waste material from the canneries in the manufacture of oil and fertilizer. The Fish Canners By-Products Co., at Ward Cove, is engaged exclusively in this business and receives its material from a number of canneries in the Ketchikan region. The North Pacific Trading & Packing Co. continued the operation of its fertilizer and oil factory at Klawak, obtaining the raw material from its salmon cannery.

The Pacific American Fisheries installed in connection with its cannery at Excursion Inlet a small reduction plant at which the cannery offal was converted into meal. Of this material 214 tons were produced and shipped to the company's establishment at Eliza Island near Bellingham, Wash., for further treatment. The process employed for the extraction of oil from this material has not proved satisfactory.

The value of fish meal for use as a stock and poultry food is pointed out very well in Bulletin No. 378 of the Department of Agriculture, published August 22, 1916. This document is by F. C. Weber of the Bureau of Chemistry of that department, its title being "Fish meal: Its Use as a Stock and Poultry Food."

The investment in the by-products industry in 1916 amounted to \$124,709, as compared with \$127,879 in 1915. A total of 75 men, all whites, were employed in 1916, 65 shoresmen and 10 transporters, which is 10 less than in 1915. The output of the industry was less in quantity than in 1915, but there was a gain in value of \$7,670.

#### OUTPUT IN BY-PRODUCTS INDUSTRY IN ALASKA IN 1916.

Items.	Quantity.	Value.
Oil.....gallons..	40,750	\$20,150
Fertilizer.....tons..	505	22,425
Edible fish meal.....do....	214	5,350
Total.....		47,925

#### HALIBUT FISHERY.

The halibut fishery is next in importance to the salmon fishery in Alaskan waters. Not only is there the catch of halibut which goes to a number of shore stations in Alaska, but there is the still more extensive fishery in extraterritorial waters, the product of which is

not handled at Alaskan ports, going instead either to British Columbia or Puget Sound ports. The statistical records elsewhere in this report show less than 12,000,000 pounds of halibut as credited to Alaska in 1916, a decrease of nearly 4,000,000 pounds as compared with 1915. But it is estimated that about 50 per cent of the entire Pacific coast catch in 1916, or upwards of 25,000,000 pounds, represents the combined catch of halibut from both extraterritorial and intraterritorial waters of Alaska. It is difficult to get precise statistics of the exact localities where catches are made, because occasionally the fishermen fear such information may invite undue competition. The fishery is prosecuted throughout the year, but it is more particularly through the summer and fall and especially in the winter that the Alaskan banks are most frequented by the fishermen. In the spring there is more activity on the banks off the coast of Washington, Oregon, and British Columbia.

Notwithstanding the lessened catch credited to Alaska in 1916, the inshore halibut fishery of southeastern Alaska was in a flourishing condition during a part of the season, especially in the vicinity of Petersburg, where a fleet of small vessels made headquarters, their catch being delivered chiefly to the floating cold-storage plant operated by the Glacier Fish Co. on the *Glory of the Seas*. This vessel was anchored for some time near that port and subsequently towed to Puget Sound. Also there was considerable shipping of boxed halibut from Petersburg to Puget Sound. Other important activities in the halibut fishery were prosecuted by the New England Fish Co. and the Ketchikan Cold Storage Co., at Ketchikan; the Booth Fisheries Co., at Sitka; the Juneau Cold Storage Co., at Juneau; and the Taku Canning & Cold Storage Co., at Taku Harbor; all of which companies operated cold-storage plants. The largest of these is that of the New England Fish Co. at Ketchikan, with a storage capacity of about 4,000,000 pounds of frozen halibut. Buyers representing Puget Sound firms were located at Ketchikan, Wrangell, Petersburg, and Juneau. It is reported that plans are taking definite form for the establishment of a large cold-storage plant at Seward for the handling of halibut. This seems a wise move, as each year the fishing vessels are going farther afield to make their catches, a noteworthy part of their operations in Alaskan waters now being conducted on Portlock Bank, less than 200 miles from Seward; thus if cold-storage facilities are provided at Seward or other towns near the principal fishing grounds much running time can be saved by the fishing vessels.

Certain losses were reported in the halibut fishery in 1916. On October 6 the halibut steamer *Independent* (151 tons net), owned and operated by the National Independent Fisheries Co., of Seattle, while fishing for halibut struck a rock off Middleton Island in central Alaska and foundered. The vessel was valued at \$50,000. The halibut

steamer *Roman* was wrecked on Key Reef in southeastern Alaska on November 18. This vessel was the property of the Columbia Cold Storage Co., of Steveston, British Columbia, and was valued at about \$80,000. In addition the cargo and fishing gear was worth approximately \$10,000. It is reported that the halibut schooner *San Jose* (14 tons net) was wrecked in Puffin Bay on the south end of Baranof Island on August 22. No loss of life was reported in any of these disasters.

Investigations were made in 1916 by Dr. Clarence W. Hahn at the bureau's laboratory at Woods Hole, Mass., with a view to determining the cause of the peculiar mushy condition of the flesh observed not infrequently in halibut on the Pacific coast. At times, notably in the early summer, this condition becomes so troublesome that the fishermen are forced to seek other grounds. Preliminary findings indicate that the trouble is due to a protozoan parasite which increases its numbers with great rapidity and causes a degeneration of the tissues. It is contemplated that further investigations will be made to determine, if possible, the cause of this disorder and to devise possible methods of control or remedies.

The season of 1916 has been remarkable on account of the very high price received by the fishermen for halibut. At Seattle in December the maximum price reached 16 cents a pound. The lowest price in the year was  $5\frac{1}{4}$  cents, while the average was nearly 10 cents a pound. In 1915 the average was about  $5\frac{3}{4}$  cents, the ranges being from a maximum of  $12\frac{1}{2}$  cents to a minimum of  $2\frac{1}{2}$  cents.

Certain unusual developments occurred in the halibut fishery of the Pacific coast in 1916. First may be mentioned the strike of the halibut fishermen, which began March 1 and was not settled until July 19. This strike grew out of a disagreement between the fishermen and the independent vessel owners. It did not affect the company vessels. As a result of the strike the production of halibut on the Pacific coast was curtailed considerably, the aggregate being only approximately 54,000,000 pounds as against about 66,000,000 pounds in 1915. The effects of the strike were felt to some extent in Alaskan waters. The reduction in the catch on account of the strike was offset to a certain degree by the entrance of a number of purse seine boats into the halibut fishery. The fact that the season in 1916 was poor for salmon on Puget Sound, coupled with the high prices prevailing for halibut, accounts for the entry of the salmon fishermen into the halibut industry.

The halibut fishery not only of Alaska, but of the entire Pacific coast, was in a very disturbed and unsettled condition throughout 1916 because of the alleged efforts of the Canadian Government to divert the trade through Prince Rupert, the terminus of the Grand Trunk Pacific Railway, which is approximately 90 miles southeast of

Ketchikan. Much apprehension has been felt by residents of Alaska and by the fresh fish interests of Puget Sound that unless the Government afforded relief through proper legislation the halibut fishery with its attendant incidental trade and benefits to American labor would be almost wholly assimilated by Canadian interests. It has also been felt that along with this would go the loss of American fishermen and their families who would take up their residence chiefly at Prince Rupert, and that most of the fishing vessels would soon be transferred to the British flag.

It has been said that there has been a well-studied effort upon the part of the Canadian authorities to effect this assimilation of the American halibut fishery. It is a matter of official record, as clearly set forth in the Canadian order in council of March 9, 1915, one part of the preamble of which in referring to fishing vessels registered in the United States says that under certain conditions a considerable number of such vessels "would transfer their base of operations from Seattle to Prince Rupert and would probably later transfer their vessels or boats to the Canadian registry and permanently operate from Prince Rupert."

Inasmuch as the full text of this order in council (P. C., 468) of March 9, 1915, has not heretofore appeared in any of the Bureau's publications, it seems proper in order to make it a matter of permanent record to reproduce it at the present time. It is as follows:

Whereas by order in council, dated 10th December, 1914, it is provided that for as period of twelve months, from the 1st of January, 1915, foreigners or foreign corporations bringing fresh fish in vessels registered in the United States of America to any port in British Columbia shall be permitted to land such fresh fish at such port without payment of duties, and transship the same in bond to any port in the United States (without the right, however, to sell in Canada any of such fresh fish so landed), and foreigners and foreign corporations bringing fresh fish in vessels registered in the United States of America to any port in British Columbia, shall be permitted to purchase supplies at any port in the said Province of British Columbia, the whole under such regulations and conditions as the minister of customs shall determine;

And whereas the said privileges are restricted to foreigners or foreign corporations bringing fish in vessels registered in the United States of America and shipping such fish in bond direct from the vessels;

And whereas this prevents smaller vessels or boats, the catches of which will not make up a carload, or the owners or operators of which may not be in a position to themselves ship their fish to the eastern United States markets, from availing themselves of the privileges;

And whereas the minister of the naval service is informed that in view of the fact that Prince Rupert is several hundred miles nearer the fishing grounds than is Seattle, and as the Grand Trunk Pacific Railway is now operating, so that fish can as readily be shipped to the eastern United States markets from Prince Rupert as from Seattle, if such boats and smaller vessels were permitted to go to Prince Rupert and sell their catches to some person or corporation which would in turn ship them in bond to the United States, and if such vessels or boats were then permitted to purchase supplies for their fishing operations, a considerable number of them would transfer their base of operations from Seattle to Prince Rupert, and would probably

later transfer their vessels or boats to the Canadian registry and permanently operate from Prince Rupert;

And whereas the bonding and outfitting privileges have been renewed to vessels shipping their own catches direct, and it is deemed advisable that such privileges should for this year be available to smaller vessels and boats;

Therefore, His Royal Highness the Governor-General in Council is pleased to order, and it is hereby ordered as follows:

The said order in council of the 10th December, 1914, is amended to provide that during the present calendar year (1915) foreigners or foreign corporations bringing fresh fish in vessels registered in the United States of America to any port in British Columbia shall be permitted to land such fresh fish at such port without payment of duties and transship the same in bond to any port in the United States, or to sell such fish in bond to such local dealers or dealer as may be properly and duly licensed therefor, under the regulations and conditions hereinafter mentioned, which dealer or dealers shall export the same in compliance with the bonding requirements (without the right, however, in either instance, to sell in Canada for consumption therein, or otherwise except in bond, any of such fresh fish so landed); and such foreigners and foreign corporations bringing fresh fish in vessels registered in the United States of America to any port in British Columbia, shall be permitted to purchase supplies, and ship crews for such vessels, at any port in the said Province of British Columbia, the whole under such regulations and conditions as the minister of customs may determine.

The foregoing order in council, aside from the preamble, was renewed with additional provisions on January 31, 1916, as follows:

During the present calendar year 1916, foreigners or foreign corporations bringing fresh fish in vessels registered in the United States of America to any port in British Columbia, shall be permitted to land such fresh fish at such port without payment of duties, and transship the same in bond to any port in the United States, or to sell such fish in bond to such local dealer or dealers as may be properly and duly licensed therefor under the regulations and conditions hereinafter mentioned, which dealer or dealers shall export the same in compliance with the bonding requirements (but without the right, however, in either instance, to sell in Canada for consumption therein or otherwise, except in bond, any of such fresh fish so landed); and such foreigners and foreign corporations bringing fresh fish in vessels registered in the United States of America to any port in British Columbia, shall be permitted to purchase bait and supplies, and ship crews for such vessels at any port in the said Province of British Columbia: Provided also, that such foreigners and foreign corporations before bringing fresh fish to a port in British Columbia, may be permitted to purchase bait at any port in the said Province of British Columbia, upon an undertaking to the satisfaction of the minister of customs that catches of fish made with any baiting so supplied shall be landed at a port on the mainland of British Columbia and be thence forwarded in bond to a port in the United States, the whole under such regulations and conditions as the minister of customs may determine.

That part of the order permitting the purchase of bait in British Columbia by American fishermen under an agreement to return their catch to a port in British Columbia was a new feature of this order.

Under the efforts of the Canadian authorities the halibut industry at Prince Rupert continued its development in 1916. The total landings of halibut at that port were approximately 19,000,000 pounds in 1916, as against about 16,000,000 in 1915. Of these

totals, American vessels landed nearly 13,000,000 pounds in 1916, and about 7,000,000 pounds in 1915. A good part of the halibut landed at Prince Rupert would undoubtedly have been handled through Alaskan ports if steps had been taken to prevent the diversion of this business to British Columbia. It is noteworthy, however, that the loss of the halibut trade to Seattle was proportionately greater than it was to Alaskan towns.

This state of affairs has given rise to much protest from American fishing interests on the Pacific coast, including many of the fishermen as well as the companies engaged in handling halibut. The demand has been made that Congress should enact legislation to protect American interests and save an American industry, rather than allow its absorption by Canada. It has been argued that the product of the fishery is almost wholly of American origin and that more than 80 per cent of it is consumed in the United States. Therefore, it has been felt that Canada in the capacity of middleman should not be allowed to dictate terms and conditions and in effect control the industry in a way that would surely cause the American consumer to pay a higher price for this product.

On August 10, 1916, a communication asking for relief from the Prince Rupert situation was addressed to the President and to the State Department, Treasury Department, and the Department of Commerce, by the Alaska Bureau of the Seattle Chamber of Commerce, transmitting a statement signed by the Booth Fisheries Co., San Juan Fishing & Packing Co., National Independent Fisheries Co., Ripley Fish Co., and the Glacier Fish Co., which concerns are interested in the halibut fishery both of Puget Sound and Alaska. The result of a continuance of existing conditions was stated in that document to be as follows:

1. A purely American industry would be permanently diverted from American to Canadian ports.
2. The \$5,000,000 capital investment of American citizens would become valueless and be absorbed by Canada.
3. The fishing fleet numbering hundreds of vessels would pass from American to Canadian registry.
4. Thousands of American fishermen would eventually be displaced by Canadian subjects.
5. American transportation companies—water and rail—would be robbed of the transportation of fish caught on our own coasts destined to American markets.
6. American commerce would lose the trade benefits incidental to operation of this \$5,000,000 industry—yet in its infancy.
7. The control of a valuable American food supply and of its cost to American consumers would pass from the United States to Canada.

The demand of the fishery interests took definite form in a bill (H. R. 15839) introduced on May 20, 1916, by Representative McGillicuddy of Maine, to regulate the importation into the United

States of halibut or salmon taken in the north Pacific Ocean and tributary waters. This bill was as follows:

That from and after ninety days after the passage of this act no fresh or frozen halibut or salmon from the north Pacific Ocean or its tributary waters shall be admitted into the United States through any foreign country except when the same shall be in bond from an American port.

In July, 1916, Senator Chamberlain, of Oregon, proposed an amendment to the revenue bill (H. R. 16763) worded the same as the McGillicuddy bill. The amendment was referred to the Finance Committee and reported back as a part (Title IX, sec. 103) of the revenue bill. On September 5, Senator Chamberlain spoke in behalf of the amendment, and it was agreed to. On September 7, when the Senate had under consideration the report of the conference committee on the revenue bill, Senator Simmons, of North Carolina, stated that very reluctantly, after much discussion, the Senate conferees were forced to recede from the amendment.

Objection was made to the Senate amendment by the House conferees because of the alleged fact that if it passed it would be regarded as an unfriendly act by Canada and that retaliatory measures affecting the fisheries of the east coast would result. No convincing arguments have as yet been advanced to cause any feeling of apprehension that Canada can retaliate on the east coast in any way that will adversely affect American interests. The outstanding feature of this is that Canada needs the markets of the United States to absorb the Canadian catch of fish; hence retaliatory measures are highly improbable.

With a view to acquiring authentic information regarding the Prince Rupert situation, the Bureau directed its local agent at Seattle, E. J. Brown, to proceed to Prince Rupert in December, 1916. The following extract from Mr. Brown's report appears to be of general interest:

The struggle between Canadian and American fish houses and fishing vessels on the north Pacific coast for the control of the offshore fisheries of the north Pacific Ocean has reached a most acute stage. Under present laws regulating these fisheries, the advantage lies wholly on the side of Canadian concerns.

The Canadian advantage, however, is not regarded as one of geographic position, of superior fleets, fishermen, or methods, or of superior transportation facilities. Natural advantages favor American cities near the fishing grounds, and American houses in selling to and American vessels fishing for American markets. The Canadian advantage is considered to be the result of artificial stimulus by way of governmental regulations. The greater portion of the catch—at least 75 per cent—is caught on banks off the American and Alaskan coasts by American vessels and consumed by American people. The Canadian regulations are obviously a means to an end. The end is the ultimate assimilation, according to official Canadian documents, of the American fishing fleet on the north Pacific coast. Later, there are indications that it would lead to the control of the selling and marketing of the catch of the fishing fleets. At present the American fish houses, with the smallest investments



possible in Prince Rupert, are, so to speak, sitting at the oars, watching events, and hoping that the artificial Canadian advantage will be broken. Once American houses are forced to install freezing and cold-storage plants on the Canadian side of the line in order to offset the present Canadian advantages in handling fish, and the American fishing vessels are compelled, as a result of Canadian orders in council, to change their base of operations to the Canadian side, a trade channel will be cut to the port of Prince Rupert that will permanently divert to that city this purely American business—an American product sold to the American people.

American concerns have to this time held off installing freezers and cold-storage plants, hoping that Canadian governmental regulations would be counteracted by at least similar governmental regulations on our own part.

#### PRESENT CONDITIONS.

There are at Prince Rupert the following fresh-fish concerns:

Canadian Fish & Cold Storage Co. (Ltd.), a Canadian corporation with freezers and cold storage; capacity, 14,000,000 pounds; authorized capitalization, \$2,500,000; said to be subsidized by Canadian Government.

The Atlin Fisheries (Ltd.), a Canadian corporation subsidiary to the New England Fish Co.; no freezers or cold storage; have shipping house and ice boxes; approximate value, \$10,000.

Goletas Fish Co. (Ltd.), a Canadian corporation; no freezers or cold storage; simply have local buying manager.

Rorvik Fish Co. (Ltd.); no cold storage or freezers; have only buying and shipping facilities.

The Booth Fisheries of Canada, a Canadian corporation, subsidiary to The Booth Fisheries Co. of America; no freezers or storage; have shipping house and ice boxes; approximate value, \$10,000.

National Independent Fisheries Co.; no cold storage or freezers; have shipping house and ice boxes; approximate value, \$10,000; subsidiary to the National Independent Fisheries Co., of Seattle.

The Pacific Fishery Co. (Ltd.), a Canadian corporation; no freezers or cold storage; shipping house and ice boxes; approximate value, \$10,000; subsidiary to San Juan Fishing & Packing Co., of Seattle.

Prince Rupert Fisheries, a Canadian concern; no freezers or cold storage; have buying and shipping facilities only.

(Note.—All of the above companies, except The Booth Fisheries, are dependent upon the Canadian Fish & Cold Storage Co. for ice. The Booth Fisheries have an ice house at Lake Kathlyn, some 200 miles east of Prince Rupert on the Grand Trunk Pacific Railway.)

In southeastern Alaska there are the following fish-buying concerns:

Juneau.—Juneau Cold Storage Co.; estimated capacity, 200,000 pounds. National Independent Fisheries Co., of Seattle; maintains fish buyer.

Petersburg.—No cold storage. Glacier Fish Co., of Tacoma; maintains buyer. Ripley Fish Co., of Seattle; maintains buyer.

Wrangell.—Columbia & Northern Fishing & Packing Co.; estimated cold-storage capacity, 300,000 pounds. Ripley Fish Co., of Seattle; maintains local buyer.

Ketchikan.—Ketchikan Cold Storage Co.; capacity, 1,000,000 pounds. New England Fish Co.; cold-storage capacity, 4,000,000 pounds. San Juan Fishing & Packing Co., of Seattle; maintains local buyer. Washington Fish & Oyster Co., of Seattle; maintains local buyer. Ripley Fish Co., of Seattle; maintains local buyer. New England Fish Co., of Vancouver; maintains local buyer.

## HANDICAPS TO AMERICAN CONCERNS AND AMERICAN FISHING VESSELS.

The handicaps imposed upon American fish houses are such that their competition with the Canadian concerns, particularly the Canadian Fish & Cold Storage Co., is only nominal. Without freezers and cold-storage capacity the American houses have no local market for American fish, on account of Canadian duties and the prohibition against American fishing vessels that their catches can not be sold direct into Canada, even on payment of duties, but must be shipped from some American port into Canada. American houses, until the 1st of December, were not allowed to ship their fish to Seattle, which is a prime factor in the halibut business, as a great portion of the catches—to wit, the “whales,” “chickens,” and “seconds”—have no market in the east, and American houses have no vessels for furnishing the same, consequently they are restricted in their buying to boats which make short and quick trips to the banks and which have a greater proportion of medium-sized, No. 1 fish, so that the other classes hereinabove mentioned can be thrown away and the trip handled at a profit.

It is not the custom in Prince Rupert to cull the catches of fish, as is the custom on the American side of the line; in fact, second-grade fish are shipped to the eastern markets and sold as first-grade fish. Second-grade, or white-meated halibut, can not be detected except by an incision, which is usually made close to the tail. White and blue-meated halibut, to all external appearances, are the same when landed, and it is not until they have been packed in ice for two weeks' time that the difference in grade is apparent. At that time the blue-meated fish is firm; the white-meated becomes mushy. Much advertising has been done by Canadian firms to the effect that they land fresher fish in the eastern markets than can be done at American ports. This does not seem possible, as there are but three trains leaving Prince Rupert per week—Wednesday, Friday, and Saturday. Fish landed at Prince Rupert on Saturday must wait, therefore, until the following Wednesday. Fish can not be landed in the eastern American markets, under normal existing conditions, as soon as they can be transported by either fishing vessel or steamer to Seattle, and then sent east by rail. The boat time between Prince Rupert and Seattle is two days; train time three days to Chicago, four days to New York or Boston. The fastest time ever made by Grand Trunk Pacific is five days to Chicago; six days to New York and Boston. The fish arriving there on any day prior to the day upon which trains leave must remain there until transportation as per above schedule is available.

Every possible inducement is made to the American fishing vessels not only to buy their supplies at Prince Rupert when not compelled to buy bait there, but also to induce them to change their registry to the Canadian flag.

The baiting restrictions and regulations imposed upon American fish houses in bringing American fish into their own country, together with Canadian tariff laws and the absence of tariff on Canadian fish in this country, have resulted in the catches of Canadian fishermen being worth from one to two cents a pound more than that of American fishing vessels. The Canadian fish can be used in both American and Canadian markets, can be used to fill up a car that is short, and can also be shipped in lots of less than 20,000 pounds, which is the capacity of a single car. It would not pay an American concern to ship a carload of fish in bond into the United States of under that weight.

Other restrictions have been imposed upon American fishing vessels. For instance, on November 23 the American fishing schooner *Venus*, Capt. A. Bernhoft, sold her catch at Prince Rupert. On the solicitation of the Canadian supply houses to purchase gear and bait there, the captain stated that he could buy his supplies cheaper in Ketchikan and would purchase there. He then went to the Canadian Fish & Cold Storage Co. for ice, but was refused ice unless he would purchase his other sup-

plies in Prince Rupert. He refused both, went to Ketchikan for his supplies and ice, and returned south of Prince Rupert to do his fishing in Hecate Strait.

Emphasis should be put upon the effect of the interpretation of the Canadian order in council which has heretofore prohibited American branch houses at Prince Rupert from shipping to Seattle their "chickens" (halibut under 12 pounds), their "whales" (halibut over 80 pounds), and their "seconds," usually the white-meated fish. As will be remembered, this is an interpretation of the order in council of January 31, 1916, which reads "transship to a port in the United States." This clause has been construed (on June 7, 1916) by Canadian authorities to refer to rail shipments only. Prior to the time of this interpretation, the American fish houses at Prince Rupert had purchased over 50 per cent of the catches of American vessels landing at that port. Since the interpretation they have purchased less than 20 per cent; in fact, the Canadian Fish Co., the subsidiary concern of the San Juan Fish Co., has not purchased a pound of fish at Prince Rupert since October 6—that is, for two months prior to this investigation there.

PRINCE RUPERT STATISTICS FOR THE YEAR 1916.

The following is a statement of the amount of fish shipped from Prince Rupert to the markets of the United States during the calendar year of 1916. The statistics were taken from the records of the United States consular office at Prince Rupert. It is estimated that about 80 per cent thereof are the catches of American vessels; about 75 per cent thereof were caught on banks lying off the United States proper in the Territory of Alaska.

Calendar year 1916.	Species.	Pounds.	Value.
Jan. 1 to Mar. 31.....	Halibut.....	3,817,648	\$364,705
	Salmon.....	124,479	8,574
	Miscellaneous.....	90,123	4,362
Apr. 1 to June 30.....	Halibut.....	2,914,007	342,330
	Salmon.....	156,588	17,871
	Miscellaneous.....	84,756	3,086
July 1 to Aug. 25.....	Halibut.....	2,948,262	334,904
	Salmon.....	122,416	13,964
	Miscellaneous.....	45,500	1,464
Aug. 26 to Sept. 30.....	Halibut.....	4,398,097	509,958
	Salmon.....	137,890	7,532
	Miscellaneous.....	45,500	1,464
Oct. 1 to Oct. 31.....	Halibut.....	1,295,030	177,226
	Salmon.....	28,833	3,794
	Miscellaneous.....		
Nov. 1 to Nov. 30.....	Halibut.....	1,018,826	163,779
	Salmon.....	100,944	10,188
	Miscellaneous.....		
Total.....	Halibut.....	16,391,870	1,892,902
	Salmon.....	671,150	61,923
	Miscellaneous (largely black cod).....	265,879	10,376

I hereby certify that this report is authentic and correct to the best of my knowledge. Nearly all totals shown are recorded in the consular office here. For this reason the above data may be relied on with the assurance that there is no clerical error in the same.

Respectfully,

HERMAN HILL,  
Deputy Collector, United States Customs.

The totals for the year 1916 will show that over 18,000,000 pounds of fish, of the value of over \$2,000,000, were landed at the port of Prince Rupert and shipped via the Grand Trunk Pacific Railroad for consumption into the United States. The freight and express received by the Canadian transportation companies thereon is approximately \$540,000. By far the greater proportion was landed by American vessels from banks adjacent to the American coast. The statistics do not cover American fish landed at Prince Rupert and sold in Canada or shipped through Canada to Europe.

## THE BAIT SITUATION.

Broad claims have been made that British Columbia has a greater supply of and superior facilities for obtaining bait, and that if the United States attempted by way of legislation to alter existing conditions Canada would retaliate by refusing American fishermen bait.

As the result of a careful study of the bait situation, it is believed that the Canadian claims are unfounded, and that the advantages with respect to the supply of bait lie with the United States and not with the Dominion of Canada. Fresh herring, practically the only bait used by the North Pacific offshore fleet, run in the waters of Puget Sound from January to May. They run in southeastern Alaska around Ketchikan and Yes Bay from November until April, and from March until October and November in the waters north of Ketchikan, such as Chatham Strait and Icy Strait. There is no place on the west coast of North America that herring are so plentiful the year round as in southeastern Alaska. In Canadian waters the herring are plentiful in the Straits of Georgia and thereabouts from January until May. In the northern waters—or those in the Prince Rupert region—the run is from the middle of December until the middle of April. In the late summer and fall of the year, bait is very scarce in Canada. The fact of the matter is, that at Prince Rupert on December 6, the fall herring had not yet put in their appearance, and for two months prior thereto the Canadian fishermen had been getting their bait in southeastern Alaska. The Alaskan cold-storage plants are now freezing herring and are providing for furnishing fishermen with bait at any time the herring are scarce.

It appears that the herring runs are not established with the same regularity as is the case of the salmon and other fishes. Occasionally there may be a week or a month when herring are plentiful in Canadian waters and are scarce in American waters, but the fact is that there are months when there are no available herring in Canadian waters, to weeks in American waters. The advantage that Canada has had in the bait situation has simply been the advantage to the fisherman of being able to buy bait where he sells his fish. If he wishes to fish south of Dixon Entrance, it is more convenient to buy bait at Prince Rupert than to run north to Ketchikan and then south again to the fishing banks. Were an American market definitely established at Ketchikan, or any other southeastern Alaskan port, the fishermen would have no trouble in getting bait. In fact, as above stated, during the months of October and November, 1916, the Canadian fishing vessels have been compelled to go to southeastern Alaska for fresh herring.

The thing that interests the fishermen and fishing vessels at present is a competitive buying market in southeastern Alaska, as they admit, and it is plain on the face of existing conditions, that either Ketchikan, Wrangell, or Petersburg is more convenient as a year-round proposition than is Prince Rupert, or any other Canadian port.

The fish on the Oregon and Washington banks, and those off Cape Flattery, the west coast of Vancouver Island, together with those from the southern part of Hecate Strait, such as Cape Scott or the Goose Island grounds, will undoubtedly be landed at Seattle, as it is the nearest port, supplies are cheaper, and a higher price can be paid for the fish as laid down at the companies' plants and freezers. Bait is always obtainable at Seattle, either fresh or frozen. The Hecate Strait grounds, adjacent to Prince Rupert, have already reached a serious state of depletion, so that only the smaller boats of 10,000 pounds and less can get paying catches there.

Canada can not retaliate against American fishermen in the matter of bait without the greatest injury to herself. By making similar regulations restricting their rights to purchase bait on the American side of the line they would be at a decided disadvantage. As a country she can not consume the fish caught by her own vessels, nor can her own vessels use the bait caught by her herring fishermen. At Ketchikan

American concerns are already making preparations for supplying American fishermen with bait. At this port there is located not only the New England Fish Co. with its 4,000,000-pound freezer and storage, but also the Ketchikan Cold Storage Co., a quasi-public concern. This company will store bait for fish for any one applying. Since preparations have been made in southeastern Alaska for supplying our fishermen with bait, any thought of Canadian retaliation by way of bait restrictions on this coast need not be considered seriously.

#### AMERICAN FIRMS CAN NOT COMPETE AT PRINCE RUPERT.

American firms can not much longer compete at Prince Rupert in the face of existing conditions. They can not compete at all without the erection of cold-storage and freezing plants, which entail investments of hundreds of thousands of dollars. Under present conditions they are not making interest upon their investments, meager as they are. If a remedy is not provided in the immediate future, conditions will compel American fish houses to make such investments, and once made they will not be duplicated in southeastern Alaska.

It seems to be the uniform opinion among American fish houses that so long as one American concern maintains a buying branch there and erects freezers and cold storage that the rest will be forced to do so. It will really establish the market at Prince Rupert. As above stated, the fear of ultimate Canadian assimilation and unfavorable conditions because of subsidies and other governmental regulations favorable to Canadian interests, has to date kept American houses from really establishing themselves at that port.

It is hoped that action will be taken soon to settle the very perplexing problem which has presented itself as a result of the entry of Prince Rupert into the Pacific Coast halibut fishery. It is also hoped that the matter will be adjusted so that Canada may enjoy to the fullest the advantages of her own fishery, but at the same time it is, however, of the greatest importance to the United States that American rights and interests be fully safeguarded in this industry which supplies American markets from American sources. Legislative action as advocated in 1916 would not prevent the Grand Trunk Pacific Railway from continuing to transport large quantities of halibut to eastern markets, but under the terms of this suggested legislation it will be necessary for fishing vessels first to land their catch at an American port where there would be competition for the transportation beneficial to the American public, which competition does not now exist at Prince Rupert.

A bill (S. 4586) was introduced February 21, 1916, by Senator Johnson, of Maine, for the protection and conservation of the halibut fisheries of the Pacific Ocean, including the establishment of a close season for halibut fishing in certain waters thereof, and placing restrictions upon the landing of halibut in the United States and the Territory of Alaska during the close season. The close season proposed by the bill included the months of December and January of each year. It was provided that a reserved area of approximately 290 square nautical miles was to be set aside off the coast of southeast Alaska between Cape Lynch and Cape Addington, where fishing for

halibut would be prohibited at all times of the year. In the absence of concurrent action by Canada the bill authorized the Secretary of Commerce to suspend the operations of the measure. The bill passed the Senate on June 3, 1916. It was reported favorably to the House of Representatives by the Committee on the Merchant Marine and Fisheries on January 29, 1917, but was not passed.

#### STATISTICAL SUMMARY.

In 1916 the investment in the halibut fishery of Alaska amounted to \$2,149,311, as against \$2,842,800 in 1915. The number of persons engaged in 1916 was 1,116, as compared with 1,455 in 1915. The production of the halibut fisheries in 1916 was 11,495,557 pounds, valued at \$679,463. This is 3,922,232 pounds less than in 1915, when 15,417,789 pounds were produced, valued at \$781,011.

#### INVESTMENT IN THE ALASKA HALIBUT FISHERIES IN 1916.

Items.	Number.	Value.	Items.	Number.	Value.
Fishing vessels:			Dories and scows.....	410	\$23,270
Steamer and power.....	163	\$890,500	Fishing apparatus.....		67,555
Tonnage.....	3,039		Shore and fixed property.....		323,486
Sailing.....	1	130,000			
Tonnage.....	2,247		Total.....		2,149,311
Outfit.....		714,500			

#### PERSONS ENGAGED IN THE ALASKA HALIBUT FISHERIES IN 1916.

Races.	Number.
Whites.....	1,076
Natives.....	40
Total.....	1,116

#### PRODUCT OF THE ALASKA HALIBUT FISHERY IN 1916.

Products.	Pounds.	Value.
Halibut:		
Fresh (including local).....	5,672,118	\$407,422
Frozen.....	5,724,023	268,319
Fletched.....	68,958	2,368
Pickled.....	25,658	1,162
Mild cured.....	4,800	192
Total.....	11,495,557	679,463

#### COD FISHERY.

The cod industry in 1916 was very prosperous. The fishing vessels made excellent catches and the price received for the product was higher than that obtained for many years. It is reported that the Norwegian cod fishery did not measure up to its normal production,

hence there was a very strong export demand for cod from Alaskan waters. The chief markets were the West Indies, South America, Hawaiian Islands, and Australia. This condition of affairs would undoubtedly have caused many others to go into the cod business but there was a scarcity of vessels, and moreover the attractive rates offered for general freighting business induced some of the cod companies to charter their vessels in the season when they were not required in Alaskan waters.

## VESSEL FISHERY.

Two changes from the previous year are noted in regard to the concerns engaged in cod fishing off the Alaskan coast in 1916. The Northern Codfish Co., of Seattle, did not operate, but its schooner *Fortuna* went to the Bering Sea banks under charter to the Pacific Coast Codfish Co. The Pacific States Trading Co., of San Francisco, retired from business early in the year and its shore station at Northwest Harbor, Herendeen Island, was taken over by the Union Fish Co. The schooners *Ottilie Fjord* (247 tons) and *Bertha Dolbeer* (230 tons), of the Pacific States Trading Co., did not go north and are not listed in the fishing fleet of 1916.

## ALASKA COD FLEET, 1916.

Names.	Class.	Net tonnage.	Operators.
Azalea.....	Schooner.....	327	J. A. Matheson, Anacortes, Wash.
Fanny Dutard.....	do.....	252	Do.
Wawona.....	do.....	413	Robinson Fisheries Co., Anacortes, Wash.
Alice.....	do.....	220	Do.
John A.....	do.....	235	Pacific Coast Codfish Co., Seattle, Wash.
Charles R. Wilson.....	do.....	328	Do.
Maid of Orleans.....	do.....	171	Do.
Fortuna.....	do.....	138	Do.
Glendale.....	do.....	281	Alaska Codfish Co., San Francisco, Cal.
Allen A. <sup>a</sup> .....	do.....	266	Do.
City of Papeete <sup>b</sup> .....	do.....	370	Do.
Maweema.....	do.....	392	Do.
Sequoia.....	do.....	324	Union Fish Co., San Francisco, Cal.
Vega.....	do.....	233	Do.
Galilee <sup>b</sup> .....	do.....	328	Do.
Martha.....	do.....	14	Do.
Golden State <sup>c</sup> .....	Power schooner.....	223	Do.
Pirate.....	do.....	30	Do.
Union Flag.....	do.....	7	Do.

<sup>a</sup> Transporting vessel for shore station catch; also made one fishing voyage.

<sup>b</sup> Made one fishing voyage and one voyage as a transporting vessel.

<sup>c</sup> Transporting vessel.

## SHORE STATIONS.

The following shore stations were operated: Alaska Codfish Co.—Kelley's Rock and Unga, on Unga Island; Companys Harbor and Murphys Cove, on Sannak Island; and Dora Harbor, on Unimak Island. Union Fish Co.—Pirate Cove, on Popof Island; Unga, on Unga Island; Sanborn Harbor and Eagle Harbor, on Nagai Island; Northwest Harbor, on Herendeen Island; Pavlof Harbor and Johnson Harbor,

on Sannak Island; Dora Harbor, on Unimak Island; and Tigalda Lagoon, on Tigalda Island. Independents operated the following shore stations on Unga Island: N. H. Johnson, at Hardscratch; John H. Nelson, at Squaw Harbor; and J. P. Fratus and A. Komedal, near Unga.

The Pacific American Fisheries put up 700 cases of canned cod at its Port Moller cannery. Of this number 463 cases were packed in one-half pound flat cans, while the other 237 cases were packed in 1-pound flat cans. The value of this product was \$2,337.

On June 11 the Union Fish Co., of San Francisco, lost the bunk house and cookhouse at its Sanborn Harbor station on Nagai Island. The buildings were set afire by the Japanese cook, who had just previously killed two fishermen and wounded three others, and who then took his own life by remaining in one of the burning buildings. This loss of property was estimated at \$2,000. J. A. Matheson lost gear valued at \$1,500. Four fishermen were drowned in Bering Sea while engaged in cod fishing.

#### STATISTICAL SUMMARY.

The investment in the Alaska cod fishery in 1916 was \$564,212, which is \$6,778 less than in 1915. The number of persons engaged was 778, being an increase of 31 over 1915.

The total production of this fishery in Alaskan waters in 1916 was 14,302,364 pounds of cod, valued at \$518,797. The increase in product over 1915 was 106,589 pounds and in value \$128,598.

#### INVESTMENT IN THE COD FISHERY IN ALASKA IN 1916.

Items.	Number.	Value.	Items.	Number.	Value.
<b>Vessels:</b>			<b>Apparatus:</b>		
Power vessels.....	3	\$37,000	Gill nets.....	1	\$25
Tonnage.....	263		Hand lines.....	4,408	2,092
Launches under 5 tons.....	3	3,000	Drag seines.....	1	200
Sailing vessels.....	16	155,732	Cash capital.....		215,333
Tonnage.....	4,292		Value of shore stations.....		136,600
Boats, row.....	365	13,980			
Pile drivers.....	2	250	<b>Total.....</b>		<b>564,212</b>

#### PERSONS ENGAGED IN THE ALASKA COD FISHERY IN 1916.

Occupations and races.	Number.	Occupations and races.	Number.
<b>Fishermen:</b>		<b>Transporters: Whites.....</b>	<b>17</b>
Whites.....	720	<b>Grand total.....</b>	<b>778</b>
Natives.....	20		
<b>Total.....</b>	<b>740</b>		
<b>Shoresmen:</b>			
Whites.....	19		
Natives.....	1		
Japanese.....	1		
<b>Total.....</b>	<b>21</b>		



## PRODUCT OF ALASKA COD FISHERY IN 1916.

Products.	Pounds.	Value.	Products.	Pounds.	Value.
Vessel catch:			Canned:		
Salted cod.....	10,562,977	\$375,060	In ½-pound flats (463 cases)	11,112	\$1,389
Tongues.....	16,200	1,230	In 1-pound flats (237 cases)	11,376	948
Total.....	10,579,177	376,290	Total.....	22,488	2,337
Shore-station catch:			Total:		
Salted cod.....	3,657,499	133,830	Salted cod.....	14,220,476	508,890
Stockfish.....	37,100	6,035	Stockfish.....	37,100	6,035
Tongues.....	6,100	305	Tongues.....	22,300	1,535
Total.....	3,700,699	140,170	Canned cod.....	22,488	2,337
			Total.....	14,302,364	518,797

## HERRING FISHERY.

The herring industry of Alaska in 1916 shows a large increase as compared with that of 1915. The chief impetus to the business was the anticipation early in the season of a heavy demand for pickled herring in the United States because war conditions had greatly limited importations of Holland and Norwegian herring. Along in the season, however, announcement was made of an agreement between the British Government and Dutch interests whereby Great Britain was to pay a bonus of 30 shillings per barrel to Dutch fishermen for herring sold to neutral countries. It was stipulated in the agreement that from September 1, 1916, the Dutch fleet could operate unmolested provided 60 per cent of the catch went to neutrals, 20 per cent was for domestic use, and 20 per cent for unrestricted export.

Those engaged in the Alaska herring industry believed that the United States would furnish the chief market for the herring to be exported from Holland under bonus from Great Britain, and when reports were received that quantities of Holland herring arriving in Chicago were selling for about \$14 per barrel, it caused the business in Alaska to wane, for those engaged realized that importations of Holland herring under the conditions stated would force the price of the Alaska product so low as to leave a very uncertain margin between profit and loss. If it had not been for this state of affairs, undoubtedly there would have been a much more active continuation of the Alaska herring industry through the fall of 1916.

Large quantities of herring were sold fresh and frozen for food purposes and for bait in halibut fishing, while a considerable quantity was converted into oil and fish meal. The number of companies and individuals engaging in this industry was larger in 1916 than in 1915, though in several instances their herring operations were incidental to other business. The Alaska Fish Salting & By-Products Co., formerly known as the Alaska Oil & Guano Co., continued the manufacture of oil and fish meal at Killisnoo, and also furnished bait

to 22 fishing vessels during the season. Another important change in ownership and transfer of interests is noted in the sale of the A. W. Thomas Co.'s business and property at Port Walter to the Alaska Herring & Sardine Co. This company engaged primarily in the canning of kippered herring.

#### METHOD OF CANNING HERRING.

Kippered herring, as a canned article, is one of the new products of the Alaska fisheries in 1916. It is believed, therefore, that a brief description of the method followed in its preparation at Port Walter will be of interest. When the herring are delivered at the cannery, usually at night or early in the morning, they are spread on the floor in a thin layer and sprinkled with salt, where they remain until such time as the cannery workers are ready to clean them. The fish are then placed on tables around which are gathered Scotch women, who dress them by cutting off the head and removing the viscera. After being cleaned in this manner, they are immersed for a short time in a tank of salt solution. The herring are then taken to the smoking room and hung by the tails on sticks studded on both sides with rows of sharpened nails. These sticks when filled with fish are placed side by side and tier above tier in the smokehouse where they are exposed to alder-wood smoke over night. During this process all surplus moisture has drained from the body cavity and surface of the fish, and the natural oil commences to appear. While in this condition, they are packed by hand in 1-pound oval cans,  $1\frac{1}{2}$  inches deep,  $7\frac{1}{2}$  inches long, and  $4\frac{1}{2}$  inches wide. Each can holds from five to eight fish. The cans are then sealed without the addition of any oil or dressing and are cooked about two hours by immersion in boiling water heated by steam. A most excellent article of food is thus prepared.

#### STATISTICAL SUMMARY.

In 1916 the total investment in the herring fishery in Alaska was \$509,046, as compared with \$211,640 in 1915. The number of persons engaged was 392, as against 158 in 1915. The products were valued at \$418,076, which is a gain of \$262,497 over 1915.

#### INVESTMENT IN THE HERRING FISHERY OF ALASKA IN 1916.

Items.	No.	Value.	Items.	No.	Value.
Vessels:			Purse seines .....	20	\$13,400
Steamers and launches .....	11	\$40,800	Drag seines .....	4	2,050
Tonnage .....	304		Gill nets .....	3	50
Sailing .....	3	16,000	Cash capital .....		273,056
Tonnage .....	440		Shore and accessory property .....		142,825
Launches under 5 tons .....	6	9,800	Total .....		509,046
Boats, row and seine .....	39	3,265			
Lighters and scows .....	9	6,400			
Pile drivers .....	2	1,400			

## PERSONS ENGAGED IN THE ALASKA HERRING FISHERY IN 1916.

Occupations and races.	Number.	Occupations and races.	Number.
Fishermen:		Shoresmen—Continued.	
Whites.....	115	Japanese.....	7
Natives.....	4	Filipinos.....	1
Japanese.....	4	Total.....	263
Total.....	123	Transporters: Whites.....	6
Shoresmen:		Grand total.....	392
Whites.....	241		
Natives.....	14		

## PRODUCT OF ALASKA HERRING FISHERY IN 1916.

Products.	Quantity.	Value.
Herring:		
Fresh, for bait.....pounds	2,124,600	\$31,100
Frozen, for bait.....do.	841,800	5,448
Pickled, for food <sup>a</sup> .....barrels	18,079	166,062
Smoked, for food.....do.	300	4,200
Canned.....cases	19,850	132,330
Dry salted, for food.....pounds	167,000	9,830
Oil.....gallons	188,926	47,231
Meal.....tons	875	21,875
Total.....		418,076

<sup>a</sup> Includes 1,590 barrels, valued at \$15,855, pickled in central Alaska.

## WHALE FISHERY.

## SHORE STATIONS.

The whaling industry in Alaska is represented chiefly by the operations of two companies—the United States Whaling Co., at Port Armstrong, and the North Pacific Sea Products Co., at Akutan. Whaling operations were conducted in a limited way in the vicinity of Nome by Ben Nygren and S. Torkensen, who, as in previous seasons, hunted the beluga, or white whale, principally for its skin. Similar work was undertaken on Cook Inlet by the Beluga Whaling Co., which was incorporated at Anchorage, Alaska, in 1916.

The United States Whaling Co. operated the same steamers in whale killing as in 1915—namely, *Star I* (133 tons), *Star II*, and *Star III* (97 tons each). The North Pacific Sea Products Co. operated, in addition to the steamers *Unimak* and *Kodiak* (99 tons each), the steam whaler *Tanginak*, of 71 net tons.

## OFFSHORE WHALING FLEET.

The steamer *Herman*, of 229 net tons, was converted into a motor-power vessel and was chartered to Capt. L. A. Pedersen, who sailed her from San Francisco early in 1916 on a trading trip to Siberian waters, from which she returned in November. Incidentally, some whaling was done, netting a small quantity of oil and bone. The auxiliary whaling schooner *Belvedere* (400 tons net) sailed from Seattle

in the spring of 1916 on a similar voyage to northern waters and returned to the same port in the fall with a small cargo of whale and walrus products. This vessel has heretofore been listed as a steamer.

#### STATISTICAL SUMMARY.

The shore whaling industry of Alaska in 1916 shows total investment of \$1,091,471, as compared with \$1,453,850 in 1915. This decline is explained by the fact that the cash capital and value of plants reported are considerably less than last year. The number of persons employed was 233, which is a gain of 29 over 1915. In 1916 the value of the product was \$363,721, as compared with \$381,750 in 1915, a decline of \$18,029. The shore stations took 389 whales in 1916, or 81 less than were taken the previous year. But notwithstanding the smaller catch, the value of the products in 1916 almost equalled that of 1915, as there was a good advance in the price of oil.

#### WHALES TAKEN IN SHORE OPERATIONS IN 1916.

Species.	Number.	Species.	Number.
Bowhead.....	1	Right.....	1
Finback.....	161	Sei.....	21
Humpback.....	121		
Sulphur-bottom.....	64	Total.....	389
Sperm.....	20		

#### INVESTMENT IN SHORE WHALE FISHERY IN ALASKA IN 1916.

Items.	Number.	Value.	Items.	Number.	Value.
Vessels:			Pile drivers.....	1	\$200
Steamers.....	6	\$280,000	Value of plants.....		490,000
Tonnage.....	596		Cash capital.....		180,000
Barge.....	1	30,000	Wages paid.....		94,171
Tonnage.....	1,149		Whale lines and harpoons.....		15,000
Launches under 5 tons.....	2	1,900	Total.....		1,091,471
Lighters and scows.....	2	200			

#### PERSONS ENGAGED IN THE SHORE WHALE FISHERY IN ALASKA IN 1916.

Races.	Number.
Whites.....	162
Natives.....	32
Japanese.....	39
Total.....	233

#### PRODUCTS OF ALASKA SHORE WHALING OPERATIONS IN 1916.

Products.	Quantity.	Value.
Whale oil.....gallons.....	717,500	\$291,500
Sperm oil.....do.....	90,500	29,750
Fertilizer, meat.....tons.....	976	37,000
Fertilizer, bone.....do.....	160	4,000
Whalebone.....pounds.....	1,873	1,471
Total.....		363,721

**CLAM FISHERY.**

Clam canning as an independent industry is a new feature in the development of the Alaska fisheries. Although some clams have been canned in southeast Alaska in past years, such operations were merely incidental to the larger business of canning salmon and did not warrant separate classification. As the demand for clam products increased, the known though undeveloped beds of razor clams in the vicinity of Mummy Island and Boswell Bay about 10 miles southeast of Cordova, attracted attention, and the first attempt to use them commercially was made in 1916 by two companies that equipped canning establishments at Cordova.

The known beds cover an area of approximately 30 square miles, extending in a belt 5 miles wide from Mummy Island to and including Boswell Bay on the northeast end of Hinchinbrook Island. It is reported that in addition to this known area the beds extend eastward in a belt 5 miles wide to Katalla Bay, a distance of about 60 miles, and are located for the most part in unprotected waters.

The Lighthouse Canning & Packing Co. was the first concern to engage in clam canning in central Alaska. In December, 1915, it acquired possession of a warehouse on the city dock at Cordova and installed therein the necessary canning machines. These were ready for operation by the end of January, but actual canning did not begin until some time later, as the work of clam digging was delayed by stormy weather. At this point it is pertinent to state that although the clams secured in the Cordova region are unsurpassed anywhere for quality, the business is more hazardous than in the Pacific Coast States because of extended periods of unfavorable weather.

The Pioneer Packing Co., a subsidiary of the Sea Beach Packing Co., of Aberdeen, Wash., built a two-line cannery near the dock of the Copper River & Northwestern Railway Co., at Cordova. The plant consists of a cannery building 32 by 165 feet and a two-story warehouse 32 by 100 feet, and has a capacity of approximately 800 cases per day. It was not ready for operation until about September 1, and for that reason only a small pack was made.

**METHOD OF CANNING.**

As this industry is new in Alaska, a brief outline of the canning process will be given. The first operation is the removal of the clams from the shells. This is done by immersing them in boiling water, either in vats especially designed to receive the wire baskets in which the clams are placed or the clams are passed through the water on an endless belt. After remaining in the water several minutes, they are thrown on a table and the shells fall away from the meat. The clams are then passed on to women workers, who open the stomachs and necks, remove the sand and sediment therefrom, and sever the

black part of the neck. The cleansing process is continued by placing the meat in a cylindrical perforated washing machine, which revolves automatically half a turn both ways in a tank filled with water. Any sediment that may have remained after the hand operations were completed is thus removed. The clams are now ready to be canned and are taken directly to the filling tables if whole clams are packed, or to the grinder if the minced variety is desired. The cans are filled by hand with both meat and juice, after which they pass through the topping and sealing machines and are sealed. The process is completed by cooking the canned product in retorts at a temperature of about 245° F. from one to one and a half hours, depending upon the size of the container used. The juice which is thrown off in the process is used in preparing the finished product, the surplus being sealed in cans.

#### INVESTMENT IN THE CLAM-CANNING INDUSTRY IN ALASKA IN 1916.

Items.	Number.	Value.
Canneries operated.....	2	\$52,123
Working capital.....		85,000
Wages paid.....		11,915
Vessels:		
Over 5 tons, power.....	1	7,000
Tonnage.....	25	
Launches under 5 tons.....	1	1,250
Row boats and skiffs.....	13	655
Total.....		157,943

#### PERSONS ENGAGED IN THE CLAM-CANNING INDUSTRY IN ALASKA IN 1916.

Occupations and races.	Number.
Diggers: Whites.....	35
Shoresmen:	
Whites.....	26
Natives.....	13
Total.....	39
Transporters: Whites.....	4
Grand total.....	78

#### PRODUCT OF CLAM CANNERIES IN ALASKA IN 1916.

Products.	Number cases.	Value.
Clams:		
3-pound flat cans.....	5,098	\$17,867
No. 1 tall cans.....	a 4,161	15,098
2-pound tall cans.....	443	1,422
10-pound tall cans.....	367	1,178
Clam juice: No. 2 tall cans.....	24	57
Total.....	10,093	35,622

a Includes 30 cases that were packed in southeast Alaska.

## MINOR FISHERIES.

## TROUT.

Dolly Varden and steelhead trout were taken commercially in Alaska to the value of \$6,935, which is a substantial gain over the production of 1915, which was valued at \$3,420. The largest items are those of 504 cases of Dolly Vardens canned by the Midnight Sun Packing Co., at Kotzebue Sound, and 39,297 pounds of frozen Dolly Vardens shipped from southeast Alaska. A few barrels of the same species were pickled in southeast and central Alaska, while 11,525 pounds of steelheads were frozen and shipped from southeast Alaska.

## PRODUCTS OF THE ALASKA TROUT FISHERY IN 1916.

Section and species.	Frozen.		Pickled.		Canned.	
	<i>Pounds.</i>	<i>Value.</i>	<i>Barrels.</i>	<i>Value.</i>	<i>Cases.</i>	<i>Value.</i>
Southeast Alaska:						
Dolly Varden.....	39,297	\$3,262	9	\$108		
Steelhead.....	11,525	385			3	\$12
Total.....	50,822	3,647	9	108	3	12
Central Alaska:						
Dolly Varden.....			8	85		
Steelhead.....					23	59
Total.....			8	85	23	59
Western Alaska: Dolly Varden.....					504	3,024
Grand total.....	50,822	3,647	17	193	530	3,095

## SABLEFISH.

The sablefish, heretofore known as the black cod, has not yet attained that importance as a product of Alaskan waters to which its very excellent food properties justly entitle it; but the hope that proper recognition will soon be given to it and that a permanent and profitable industry in the sablefish fishery will be established, finds encouragement in the increased quantity and value of the catch in 1916 over that of the preceding year. The total production in 1915 was 142,550 pounds, valued at \$3,971, while in 1916 it was 304,141 pounds, valued at \$11,185, the increase in quantity being 161,591 pounds and in value \$7,214.

## SHIPMENT OF SABLEFISH FROM ALASKAN WATERS IN 1916.

Condition.	Pounds.	Value.
Frozen.....	162,891	\$3,652
Pickled.....	116,215	6,746
Fresh.....	25,035	787
Total.....	304,141	11,185

## ATKA MACKEREL.

This is a valuable food fish which is found throughout the extent of the Aleutian Islands. Practically nothing has been done as yet to exploit this fish commercially, but it is hoped that there may be early expansion along this line. The fish are easily taken by hook and line and are of good size, and in every way well adapted to pickling. A. C. Goss, of Unalaska, was granted a permit to fish for Atka mackerel within the Aleutian Islands Reservation, and as a result the natives of Attu fished one day, June 6, 1916, and took 6,500 of this species, from which Mr. Goss packed 27 barrels, valued at \$270.

## RED ROCK COD.

The red rock cod, or rockfish, is now attracting more attention in Alaska than formerly. It is a good food fish and in addition to being consumed locally should merit more extensive exportation to Puget Sound. The flesh is firm and shipments to Puget Sound can be made in ice in the same way that salmon are shipped fresh. This species may also be pickled, or it may be frozen. The red rock cod takes the hook freely. Heretofore it has been caught in some numbers by halibut fishermen, who until recently have not regarded it as worth saving. In 1916 rock cod to the amount of 36,000 pounds, valued at \$1,080, was sold fresh, and 9,200 pounds, valued at \$214, was pickled. The total product was thus 45,200 pounds, valued at \$1,294. These shipments were from southeastern Alaska.

## CRABS.

Crabs of excellent quality are found in many places in Alaskan waters. Their use so far has been almost wholly to supply local demands. They are on sale usually at local markets in Ketchikan, Juneau, and other towns. Some shipments of crabs have been made to Puget Sound and it is not unlikely that before long this industry may be developed more extensively.

## MUSSELS.

Attention is invited to the extensive deposits of mussels in the waters of Alaska. They are of good quality and when the American trade develops the demand for mussels, Alaska will afford a profitable field for the prosecution of the industry. Mussels are used as extensively in Europe as oysters are used in the United States. It is believed that in due course of time there may also be similar demand for mussels in this country.

## SHRIMPS.

The shrimp industry has begun to develop in Alaska. Certain waters in the southeastern section are known to yield shrimp of



excellent quality and large size. In 1916 there was some activity in this work in the vicinity of Petersburg. There is every reason to believe that the business may be expanded very materially. According to the customs records the exportations from Alaska in 1916 were 68,845 pounds of shrimps in brine, valued at \$2,770; 3,060 pounds dried shrimps, valued at \$831; 100 pounds shrimp meat, valued at \$35; and 3,880 pounds shrimp fertilizer (shells), valued at \$114. The total value of the shrimp products in 1916 was \$3,750.

#### SHARKS.

Recently there has been considerable progress in the utilization of shark skins in the manufacture of leather, thus opening up an opportunity to utilize more fully another aquatic resource heretofore practically neglected. With a view to taking advantage of this opportunity a company was formed by Messrs. J. H. Scott and James Lee, with headquarters at Ward Cove, to engage in the taking of mud sharks in southeastern Alaska between Petersburg and Juneau. The motor scow *Elliott* (139 tons net) was utilized in the work, which resulted in the capture of 450 sharks. The carcasses were not used, but it is hoped that in future operations they may be converted into fertilizer. The hides were valued at \$4,000, and the livers yielded 2,700 gallons of oil, valued at \$1,350. The total value of the shark products was therefore \$5,350. The investment in this fishery was \$11,600, and employment was given to 12 persons, all whites. Certain preliminary steps have been taken by J. F. Lavarne, with a view to establishing this industry in the vicinity of Seward.

## FUR-SEAL INDUSTRY.

### PRIBILOF ISLANDS.<sup>a</sup>

#### GENERAL ADMINISTRATIVE DUTIES.

The chief duties of the Bureau in connection with the fur-seal fisheries was, as in former years, the administration of the affairs of the Pribilof Islands Reservation. The general oversight of the fur-seal herd; the support, care, and education of the native inhabitants; the preservation of the skins of the seals taken for food purposes; the care of the fox herds and the taking and preservation of fox pelts; and the maintenance and upkeep of the Bureau's property on the islands are regular duties which tax to the utmost the limited number of employees available for detail to these islands. In addition some attention is given to scientific work. In 1916 additional information was secured in regard to seals of known ages, seals branded in 1912 affording the basis for the observations. A census of the seal herd was again taken. Owing to the rapid increase in the size of the herd the work of taking the census becomes increasingly complicated from year to year and was attended with particular difficulties in 1916.

#### PERSONNEL.

A list of the statutory employees on the Pribilof Islands is shown in the introduction. The following additional information is given regarding the activities of certain employees:

Assistant Agent Harry J. Christoffers, who had been temporarily detailed to St. Paul Island since September, 1915, to relieve Agent and Caretaker Fassett, returned to Unalaska in June, Mr. Fassett having returned to St. Paul May 31. Assistant Agent Hanna reached St. Paul May 31. He was appointed storekeeper, effective September 16. Storekeeper Bishop left St. Paul May 31. Dr. Miles reached St. Paul in September; Dr. Hunter left in October. Agent and Caretaker Proctor, who had been at the Pribilof Islands continuously for a period of over five years, left for the States in October. Storekeeper Hanna was detailed to St. George Island to take charge of the Department's work there during Mr. Proctor's absence. Warden Scudder was detailed from southeast Alaska to St. Paul, arriving there in September, to assist with work in Mr. Hanna's absence. Mrs. A. H. Proctor was employed temporarily in connection with the schools on St. George for a portion of the year. Later her work was taken up by Mrs. G. Dallas Hanna.

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<sup>a</sup> The reports of H. C. Fassett, A. H. Proctor, and others have been drawn on freely in the preparation of this section.

## PURCHASE AND TRANSPORTATION OF SUPPLIES.

The natives of the Pribilof Islands, who on June 30, 1916, numbered 311, have to be supplied in large measure from outside sources with the necessities of life. There is, of course, an abundance of seal meat available at the islands, and fish, sea lions, wild birds, and birds' eggs are utilized to some extent. The seal meat, while unlimited in quantity so far as the requirements of the natives are concerned, must be used with moderation and not to the exclusion of other foods. The reindeer herds which were placed on the islands in 1911 have not yet contributed any material quantity of food. Driftwood, which is found along the beaches, is available as fuel to only a limited extent. It follows that considerable quantities of food and fuel for the natives must be taken to the islands. In addition, clothing, shelter, and household furniture must be provided. The purchasing and transportation of these supplies, together with those required for the conduct of the Bureau's general business on the islands, require a large amount of work and attention.

A small quantity of supplies was purchased at Seattle in April by an agent of the Bureau and transported to the Pribilofs through the courtesy of the Coast Guard.

Following the plan of the previous year, schedules of the general supplies to be purchased were printed and distributed to prospective bidders. The proposals received were made the basis for the subsequent purchases.

The steamer *Elihu Thomson* was chartered from the Pacific Cold Storage Co., of Tacoma, Wash., for the purpose of transporting the supplies to the islands. The vessel was loaded at Seattle and left there September 5. Dutch Harbor was reached September 16. From Dutch Harbor the vessel went to Unalaska on the 17th, left there on the 18th, and arrived at St. George Island the morning of the 19th. Unfavorable weather conditions delayed the discharging of the cargo and the loading of miscellaneous outgoing freight, including the annual shipment of fur-seal skins, and it was not until October 12 that the vessel was able to leave the islands. Direct passage was made to Taku Harbor, where, in accordance with previous arrangements, a cargo of canned salmon was placed aboard the vessel for the account of the Pacific Cold Storage Co. The ship arrived at Taku Harbor October 19, left there the 21st, and arrived at Seattle on the 26th.

No landing can be made at either St. Paul or St. George Islands by vessels of any size. Ships visiting these islands must anchor offshore, and any merchandise to be landed must be taken ashore in lighters. In the past the native bidarras have been used for this work. The decrease in the available supply of sea-lion skins, used for covering

the bidarras, made it necessary in 1916 to provide some other form of boat to supplement the bidarras. Two flat-bottom skiffs, built somewhat after the pattern of the Karluk skiff, were shipped from Seattle and used in connection with the unloading of supplies at St. Paul Island. They were satisfactory in smooth water, but were not as good as the bidarras in rough water. At St. George a canvas-covered bidarra was tried out with fairly satisfactory results. The canvas used was No. 0. By using heavier canvas and placing chaffing strips of iron bark on the bottom and sides it is believed that a canvas cover will be as satisfactory as one made from sea-lion skins.

#### NATIVES OF THE PRIBILOF ISLANDS.

No important changes took place among the native inhabitants of the islands in 1916, either in respect to their numbers or mode of life. The isolation of the islands naturally tends to keep the existing populations intact, and they have remained approximately the same in numbers for many years.

#### SUPPORT.

Very little opportunity exists for the natives of the Pribilofs to secure for themselves the means of a livelihood. They were originally taken to the islands to assist in sealing operations, and with the decline of the sealing industry their most important occupation was lost to them. The soil and climate do not permit the raising of agricultural products except to a very slight extent, and natural resources susceptible of exploitation at present are almost nonexistent. The result is that in recent years the Government has been obliged to contribute largely to the support of these people. The Bureau is endeavoring to develop as far as possible opportunities whereby the natives may assist themselves. Among the possibilities which have been suggested are the development of the local fishery, the making of souvenirs and curios for sale to tourists and others, the development of the reindeer herds, and the introduction and utilization of various domestic animals.

In recent years the natives have received some assistance in the way of employment given them by the Navy Department in connection with the local radio stations. As a result of a decision by the Comptroller of the Treasury, they will be paid in cash for services performed in the taking of fox skins at the islands, payments to be made from the proceeds of the sales of the skins at the rate of \$5 for each skin taken.

#### HEALTH.

The services of a physician were available on each island throughout the year. The appropriations provide for only two physicians for the Pribilof Islands, and since it is manifestly essential that one

be on duty at all times on each island it is impossible to grant either a leave of absence at any time. This condition in connection with the impracticability of employing physicians temporarily as reliefs for the permanent ones makes it generally necessary for a physician to resign in order to obtain a leave of absence. Some method whereby this difficulty may be overcome should be evolved. It has been suggested that it might be possible to secure the services of physicians for limited periods from some other branch of the Government service.

In these primitive communities on St. Paul and St. George Islands the work of the physicians is in no small degree that of preventing disease and of improving general sanitary conditions. In addition to purely professional work they are called upon to give attention to the condition of the houses of the natives, to their food, clothing, and methods of living in general. While much has been accomplished in raising the standard of living among these people, and while conditions as a whole are probably on a more desirable plane than ever before, much remains to be done, and a large field for useful work is open to physicians who are sufficiently interested in this kind of work to undertake it with enthusiasm.

*St. Paul Island.*—The health of the natives was on the whole satisfactory during the year. With the exception of an epidemic of gastroenteritis in February and March, there was very little real sickness. During this period two deaths occurred; one from acute gastroenteritis and one from chronic pulmonary tuberculosis with acute gastroenteritis.

The hospital which was opened in 1915 has proved a decided success and of great help to the resident physician. In the period from September 1, 1915, to September 1, 1916, eleven cases were treated there. Among these were a patient from the navy collier *Saturn* and two from the Navy radio station. In this connection it may be stated that in the same period the physician on numerous occasions rendered services, including dental work, to persons employed by the Navy Department.

In cooperation with the school-teachers, attention was given to sanitary conditions in the school, and the children were instructed in elementary principles of hygiene and in breathing and other healthful exercises. It is hoped that the instruction given in the school will have a beneficial influence upon the home life of the children, in which the field for improvement is large.

In the latter part of 1915 a physical examination was made of each native on St. Paul. This examination gave the physician an opportunity to inform himself quite thoroughly in regard to the physical condition of each one and was especially valuable in bringing to light defects and weaknesses which in many cases would otherwise have

remained unsuspected. Each native was given instruction in bodily hygiene and special treatment whenever the circumstances required it. The Bureau plans to have these examinations repeated from time to time.

In connection with the physical examinations, special efforts were made to inculcate in the natives an appreciation of the value of proper care of the teeth. Dr. Hunter had some knowledge of dentistry, and during the period of his work at St. Paul attended to such dental work as was practicable under the circumstances.

It is worthy of mention that certain insanitary practices formerly common among the natives in connection with their religious ceremonies have been discouraged. The natives as a whole have not proved obstinate in this matter, and while they have not discontinued the practices altogether much has been accomplished.

*St. George Island.*—In addition to the treatment of specific cases of illness, attention was given to sanitary matters about the village, the condition of the natives' houses, the condition of seal meat preserved by the natives for food, and to other matters of hygienic importance.

Quarters should be fitted out on St. George Island for use as a hospital. Facilities for the proper treatment of patients are as necessary there as on St. Paul Island, where the benefits accruing from a small but well-planned hospital are unquestionable.

#### SCHOOLS.

The Bureau is charged with the education of the native children on the Pribilof Islands and three teachers are regularly employed, two on St. Paul and one on St. George. In addition, a temporary assistant is employed at a nominal salary to assist with the work on St. George. The opportunities which the children have for acquiring useful knowledge and right methods of living are so limited that the responsibility placed upon the teachers is one which should be assumed only by those who are actually interested in the work for its own sake. The Bureau feels that the present teachers are fully awake to the situation and are accomplishing much good.

*St. Paul Island.*—The 1915-16 session began September 13, 1915, and ended May 26, 1916. Sixty pupils were in attendance. The courses prescribed for ordinary schools were kept in mind and followed in all the essentials as far as was possible and practical. Special effort was made to have the children speak and read English and to think in that language, and much ingenuity was displayed by the teachers in their efforts to secure the desired results. Attention was given to the health of the pupils and gymnastics were made a part of the regular program. Music, games, and nature-study work were interspersed with the more formal phases of school routine. The increased facility in the use of English on the part of the chil-

dren and the marked improvement in their conduct and general appearance have been made the subject of very favorable comment.

During the summer months of 1916 efforts were made along lines suitable to the vacation period to keep the children interested in their work.

The 1916-17 session began September 12, with an enrollment of 64 pupils.

*St. George Island.*—Senior and junior schools were maintained on this island during the 1915-16 school year. The senior school was opened on September 6, 1915, and was continued until May 26, 1916. Twenty-four children, ranging in age from 7 to 17 years, were in attendance. In addition to the usual courses of instruction, special efforts were made to promote the use of English by the children in their ordinary conversation. Instruction was given the girls in plain sewing and darning and the boys in cobbling. During the vacation period in the summer season of 1916, with the exception of a short period when the teacher was detailed to St. Paul Island to assist with the seal census, the children were assembled one-half day each week for supplementary instruction.

The junior school was opened on September 8, 1915, and was continued through July, 1916. At the beginning of the term 23 children, ranging from 3 to 6 years of age, were in attendance. It was soon found that those 3 years of age were too young and they were excused from further attendance. Kindergarten methods were employed, and it is felt that the benefits which these small children receive through intelligent direction of their activities fully justify the continuance of this kind of instruction.

*Attendance at Salem Indian Training School.*—Most of the Pribilof Islands natives who were in attendance at the Salem Indian Training School, at Chemawa, Oreg., in 1915, continued their studies there in 1916. Two other natives, Ioaniky Emanoff and Peter Tetoff, of St. Paul Island, came on the supply ship to Seattle in the fall and entered the school in October.

NATIVES OF THE PRIBILOF ISLANDS IN ATTENDANCE AT THE SALEM INDIAN TRAINING SCHOOL, CHEMAWA, OREG., IN 1916.

Name.	Attendance began—	Remarks.
George Lekanof.....	August, 1914.....	From St. George Island.
Constantine Lestenkof.....	.....do.....	Do.
Alexey Emanoff <sup>a</sup> .....	October, 1915.....	From St. Paul Island.
Agrafina Fratis.....	.....do.....	Do.
Julia (Ouliana) Fratis.....	.....do.....	Do.
Martha Fratis.....	.....do.....	Do.
Ioaniky Emanoff.....	October, 1916.....	Do.
Peter Tetoff.....	.....do.....	Do.
Alexander Melovidov.....	July, 1911.....	Entered from St. Paul Island, but no longer a resident of the Pribilofs.

<sup>a</sup> Left the Chemawa school on February 29, 1916, for the school at the Fort Lapwai Sanitarium, Lapwai, Idaho, on account of condition of health.

## SAVINGS ACCOUNTS.

The Washington Loan & Trust Co., Washington, D. C., has remained throughout the year the depository of the natives' personal funds in the custody of the United States Commissioner of Fisheries as trustee. Interest is paid on these funds at the rate of 3 per cent per annum and is calculated on monthly balances. It is credited on the last days of December and June (or on the first days of the months following) of each year for the preceding periods of six months.

On January 1, 1916, the amount of the funds including interest, \$75.39, credited December 31, 1915, was \$5,068.61. Interest credited June 30, 1916, amounted to \$74.84. The amount withdrawn for the natives in the year was \$484.87. The balance on January 1, 1917, including interest, \$70.78, credited on that date, was \$4,729.36.

The account is subject to an audit by the disbursing clerk for the Department twice each year.

PRIBILOF ISLANDS NATIVES' SAVINGS ACCOUNTS IN THE CUSTODY OF THE UNITED STATES COMMISSIONER OF FISHERIES, AS TRUSTEE, JANUARY 1, 1917.

Funds of—	Amount.	Funds of—	Amount.
St. Paul Island:		St. Paul Island—Continued.	
Bourdukofsky, Apollon.....	\$221.95	Merculief, Marian.....	\$34.36
Bourdukofsky, Peter.....	133.30	Merculief, Paul A.....	13.46
Diakanof, Auxenia.....	22.88	Merculief, Terrenty.....	34.36
Emanoff, Alexey.....	262.48	Oustigof, Peter.....	98.04
Fratiss, Agrifina.....	82.51	Pankof, Agrifina S.....	305.26
Fratiss, Akalina.....	486.24	Rookavishnikof, Elizabeth.....	27.02
Fratiss, Martha.....	82.49	Stepetin, Marina.....	15.09
Fratiss, Ouliana.....	82.49	St. George Island:	
Gromof, Ouliana.....	843.05	Merculiof, Agrifina <sup>a</sup> .....	159.48
Hanson, John.....	73.48	Galanin, Mary.....	276.36
Kozlof, Parascovia.....	174.35	Lestenkof, Dimitri.....	115.15
Krukof, Julia B.....	105.69	Lestenkof, Michael.....	280.78
Melovidov, Alexandra.....	38.32	Merculiof, Joseph.....	104.42
Melovidov, Alfay.....	38.32	Philomonof, Mary <sup>b</sup> .....	105.32
Melovidov, Anton.....	15.04	Prokopiof, Peter.....	66.41
Melovidov, Joseph.....	38.32	Shane, Michael.....	74.31
Melovidov, Marcia.....	38.32	Philomonof, Zoya <sup>c</sup> .....	143.90
Melovidov, Salome.....	1.02	Zacharof, Emanuel.....	28.36
Melovidov, Vincent.....	38.31		
Merculief, Dosofoy.....	34.36	Total.....	4,729.36
Merculief, Macar.....	34.36		

<sup>a</sup> Formerly Agrifina Bogadanof, of St. Paul Island.

<sup>b</sup> Deceased, estate undivided.

<sup>c</sup> Formerly Zoya Swetzo.

## CENSUS.

A recapitulation of the census of native inhabitants of St. Paul Island as of June 30, 1916, is as follows:

Total native population June 30, 1915.....	193
Births during year ended June 30, 1916.....	6
Returned to island from school, year ended June 30, 1916.....	1
Departures during year ended June 30, 1916.....	5
Deaths during year ended June 30, 1916.....	3
Total native population June 30, 1916.....	192



A recapitulation of a similar census for St. George Island follows:

Total native population June 30, 1915.....	121
Births during year ended June 30, 1916.....	6
Deaths during year ended June 30, 1916.....	8
Total native population June 30, 1916.....	119

From the foregoing it will be noted that the total native population of the Pribilof Islands on June 30, 1916, was 311, as compared with 314 on June 30, 1915.

#### INTRODUCTION OF DOMESTIC ANIMALS.

With the view of determining whether Angora goats might not be successfully introduced on the Pribilof Islands, a number were sent from Seattle on the supply ship. Nine were delivered to St. Paul Island and six to St. George Island.

It is felt that if the experiment proves successful the animals will not only contribute to the support of the natives, but will afford an opportunity for them to acquire personal ownership of live stock and to profit through their own individual efforts. It is hoped that the animals will be able to subsist themselves, though shelter will have to be provided for the winter season. The live stock owned by individual natives on the islands is at present limited to poultry.

#### FUR-SEAL HERD.

##### KILLING OF SEALS.

The law limiting the killing of fur seals on the Pribilof Islands to the number required for the use of the native inhabitants remained in effect throughout the year. The Department decided tentatively upon 5,000 3-year-old male seals as a proper allowance for this purpose, but authorized the killing of additional seals up to 7,500 if that number could be properly utilized. It was also arranged that a limited number of seals of other ages might be taken in place of 3-year-olds as needed for special purposes. It was also provided that the seals should be taken at St. Paul Island and St. George Island approximately in proportion to the native population of the two islands. On this basis about 5,000 of the 7,500 would be allowed for the uses of the St. Paul natives and 2,500 for the St. George natives. Circumstances later made it desirable to change this ratio by increasing the percentage which might be taken at St. George. Under present conditions the only use made of seals by the natives is to supply meat for food. The number of seals killed in the calendar year 1916 for food was 3,483 on St. Paul Island and 2,983 on St. George Island, a total of 6,466 for both islands.<sup>a</sup>

<sup>a</sup> In arriving at the total number of seals killed on each island the Bureau has had to depend upon telegraphic advices in respect to the number killed after the close of navigation in the fall of 1916. Subsequent reports may indicate very slightly different totals.

The number of seals reported as killed for food purposes does not necessarily correspond with the number of skins secured, for from time to time individual seals are found dead from which merchantable skins are obtained.

RECORD OF FUR SEALS KILLED ON ST. PAUL ISLAND, ALASKA, IN THE CALENDAR YEAR 1916.

Date.	Hauling ground driven.	Num-ber.	Date.	Hauling ground driven.	Num-ber.
Mar. 3	Sivutch (Sea Lion Rock).....	59	July 24	Reef.....	<i>e</i> 195
May 27	Reef.....	<i>a</i> 101	26	Reef and Gorbatch.....	<i>f</i> 284
30	Northeast Point.....	1	27	Northeast Point.....	1
June 3	Reef.....	67	29	Gorbatch.....	<i>b</i> 178
3	Polovina.....	1	29	Northeast Point.....	1
7	Northeast Point.....	1	Aug. 1	Tolstoi.....	241
10	Polovina.....	1	4	do.....	<i>b</i> 117
12	Reef.....	209	9	Northeast Point.....	1
14	Northeast Point.....	1	11	Gorbatch.....	59
17	Polovina.....	1	Sept. 3	Northeast Point.....	1
22	Northeast Point.....	1	4	Gorbatch.....	61
23	Reef.....	60	12	Northeast Point.....	1
27	Northeast Point.....	1	Oct. 12	do.....	1
30	Reef and Gorbatch.....	366	17	Tolstoi.....	53
July 5	Northeast Point.....	1	17	Northeast Point.....	1
6	Gorbatch.....	<i>b</i> 113	27	Reef Peninsula.....	113
10	Reef and Parade Ground.....	<i>c</i> 272		Subsequent killings through	
15	Reef and Gorbatch.....	481		Dec. 31.....	<i>g</i> 343
18	Northeast Point.....	1		Total.....	3,483
20	Reef and Gorbatch.....	<i>d</i> 1			
22	Reef.....	93			

*a* Includes 1 which died on drive and 11 which were suffocated on killing field.

*b* Includes 1 which died on drive.

*c* Includes 2 which died on drive.

*d* Found dead on line of drive of July 15.

*e* Includes 5 which died on drive.

*f* Includes 18 which died on drive.

*g* Details not available owing to close of navigation in the fall of 1916. It is contemplated printing them in the corresponding report for 1917.

RECORD OF FUR SEALS KILLED ON ST. GEORGE ISLAND, ALASKA, IN THE CALENDAR YEAR 1916.

Date.	Hauling ground driven.	Num-ber.	Date.	Hauling ground driven.	Num-ber.
June 9	East Cliffs.....	32	July 27	Zapadni.....	22
13	Zapadni.....	2	29	East Cliffs.....	103
15	North.....	34	Aug. 1	North.....	120
22	Staraya Artil.....	49	3	East Cliffs.....	213
22	Zapadni.....	1	5	North.....	145
24	East Cliffs.....	123	8	East Cliffs.....	40
27	North.....	201	10	North.....	94
29	Staraya Artil.....	55	10	Zapadni.....	1
July 1	East Cliffs.....	115	Oct. 16	do.....	1
5	North.....	169	20	Staraya Artil.....	40
7	East Cliffs.....	109	23	East.....	78
11	Staraya Artil.....	71	27	Staraya Artil and North.....	88
12	North.....	295		Subsequent killings through	
15	East Cliffs.....	355		Dec. 31.....	<i>a</i> 297
16	Zapadni.....	1		Total.....	2,983
22	do.....	1			
24	North.....	128			

*a* Details not available, owing to close of navigation in the fall of 1916. It is contemplated printing them in the corresponding report for 1917.

WASTE SEALING PRODUCTS.

The suggestion having been made that the deposits of bones of fur seals and sea lions on the Pribilof Islands might be sufficient in quantity and in quality to warrant their exploitation commercially,

an investigation was undertaken in 1916 in order to obtain the salient facts.

The work was taken up along two lines—first, to ascertain the extent of the deposits on the islands and, second, to ascertain the commercial value of the bones. It was not practicable to undertake field work for the purpose of ascertaining the quantity of bones until late in the summer. Various areas were examined in a systematic manner, but the season's work was completed so late that a full report could not be completed before the departure of the last vessel leaving the islands in the year. A preliminary report received by the office indicated that on the fields which were examined there are about 6,000 tons of bones and that other fields not examined would also prove to be productive of material. A considerable quantity of bones was also collected and forwarded to Seattle on the supply ship. Portions of this consignment were subsequently forwarded to various persons and firms who were interested in the matter and desired to have an opportunity to examine and analyze the material. An analysis of a quantity of the bones by the Bureau of Soils, Department of Agriculture, showed that they contained from 24.85 to 25.26 per cent of phosphoric acid and from 4.57 to 4.80 per cent of nitrogen.

When the commercial killing of seals is again resumed the surplus carcasses will be available as a source of fertilizer material and possibly of other products. Use is made of waste meat and bones in the preparation of food products for domestic farm animals, and the possibility of utilizing seal carcasses for these products should receive careful consideration. It has been estimated roughly that the amount of raw material available will be about 50 pounds per seal.

*Seal throats.*—The natives of the Pribilofs are accustomed to utilizing to a limited extent the tough, leathery throats of the fur seals in the manufacture of cardcases and other small articles, chiefly for sale as souvenirs. In 1915 and 1916 efforts were made by the Bureau to determine whether a product could not be made from these throats which would meet with a steady demand in some industry. Quantities of the throats were secured at the islands and steps were taken to bring the subject to the attention of various firms which might be interested in experimenting with the material. A few samples were tanned by the Helburn Leather Co., Salem, Mass. The quality of the product was satisfactory, but the expense of tanning the throats, due to their small size, made it questionable whether they could be marketed in competition with other products. However, the Bureau has not suspended its efforts, and it is hoped that sooner or later some one will find an economic use for what remains otherwise largely a waste product.

## CENSUS OF THE FUR-SEAL HERD.

As in previous years, a census of the fur-seal herd at the Pribilof Islands was taken in 1916. A census has been taken annually since pelagic sealing was abolished, and the results show clearly the rapid recuperation of the herd when relieved from the disastrous effects of pelagic sealing.

The censuses of 1912 and 1913 were taken by George A. Clark. The 1914 census was taken by Messrs. Osgood, Preble, and Parker in connection with a special investigation made by them, the results of which were published in Bureau of Fisheries Document No. 820. The 1915 and 1916 censuses were taken under the direction of G. Dallas Hanna, assisted by other officers of the Alaska service. Owing to the different circumstances under which the censuses were taken, the development of additional information in regard to the herd from year to year, including a better understanding of the annual percentage of mortality in the younger animals, the figures for those components of the herd which can not be actually counted in their entirety are not exactly comparable. The classes whose numbers may be obtained by actual count are harem bulls and pups of the season. The idle bulls may be counted with considerable accuracy. The number of breeding cows in any season, which class includes all females 3 years of age and upwards, is equal to the number of pups born that season.

In computing the number of young seals of various classes in 1915 and 1916, by making deductions from the number of pups born in preceding years, the natural mortality of young seals at sea was placed at 35 per cent for the first year, 20 per cent for the second year, and 4 per cent for the third year. This assumption calls for a survival to the end of the third year of approximately 50 per cent of the seals born. The loss in the fourth, fifth, and sixth years is known to be small, and it is believed that the deductions made for the losses in the first three years are sufficiently ample to cover those of the fourth, fifth, and sixth years. In 1914 the assumed percentages of loss were 50 per cent for the first year, 15 per cent for the second, 10 per cent for the third, and 5 per cent for the fourth year.

In 1916 the class of seals which was designated as young bulls in the censuses of 1912, 1913, and 1914 was divided into 5 and 6 year-old classes. The young bulls of the 1915 census were considered as 5-year-olds, and in the table which follows they have been referred to that class. At the time the 1915 census was taken it was believed that the 6-year-old bulls were included among the harem and idle bulls. Deductions from studies subsequently made indicate that when the number of idle bulls is equal to more than 50 per cent of the number of harem bulls, as was the case in 1916, the 6-year-old males are properly excluded from these classes.

## GENERAL COMPARISON OF RECENT CENSUSES OF THE SEAL HERD.

Class of seals.	1912	1913	1914	1915	1916
Breeding bulls.....	1,358	1,403	1,559	2,151	3,500
Breeding cows.....	81,984	92,269	93,250	103,527	116,977
Idle bulls.....	113	105	172	673	2,632
Young bulls (chiefly 5-year-olds).....	199	259	1,658		
6-year-old males.....					11,167
5-year-old males.....				11,271	15,494
4-year-old males.....	100	2,000	9,939	15,848	15,427
3-year-old males.....	2,000	10,000	13,880	18,282	19,402
2-year-old males.....	11,000	15,000	17,422	23,990	24,169
Yearling males.....	13,000	20,000	23,068	30,307	33,645
2-year-old cows.....	11,000	15,000	17,422	23,990	24,245
Yearling cows.....	13,000	20,000	23,067	30,306	33,646
Pups.....	81,984	92,269	93,250	103,527	116,977
Total.....	215,738	268,305	294,687	363,872	417,281

The following information in regard to the 1916 census is taken from Mr. Hanna's report:

*Pups.*—An enumeration of all the pups born in the season was made between July 26 and August 15, both dates inclusive. The work was carried on with considerably greater difficulty than in former years. Not only was there a much larger number of animals to be counted, but other conditions resulting from the increase in the size of the herd contributed to the difficulty. The work of completing the count was delayed until August 15, when some of the pups had taken to the water, and this, together with the unfavorable conditions for counting pups on the breeding grounds due to the presence there of more bulls than in previous years, may have resulted in an error in the count amounting to as much as 3 or 4 per cent. It is not believed that the error was more.

## DISTRIBUTION OF PUPS AT THE PRIBILOF ISLANDS IN 1916.

Rookery.	Date of counts.	Living pups.	Dead pups.	Total pups.
ST. PAUL ISLAND.				
Kitovi.....	Aug. 3.....	2,445	27	2,472
Lukanin.....	Aug. 1.....	2,055	86	2,141
Gorbatch.....	Aug. 3.....	8,612	252	8,864
Ardiguen.....	do.....	693	7	700
Reef.....	July 27.....	16,148	183	16,331
Sivutch.....	July 26.....	4,951	69	5,020
Lagoon.....	July 29.....	385	3	388
Tolstoi.....	do.....	11,919	146	12,065
Zapadni.....	Aug. 2 and 14.....	9,535	147	9,682
Little Zapadni.....	Aug. 14.....	6,127	150	6,277
Zapadni Reef.....	Aug. 2.....	262	4	266
Polovina.....	Aug. 1.....	4,631	113	4,744
Polovina Cliffs.....	do.....	1,663	20	1,683
Little Polovina.....	do.....	1,059	15	1,074
Morjovi.....	July 30.....	2,717	44	2,761
Vostochni.....	{ do..... Aug. 15..... }	23,483	904	24,387
Total.....		96,685	2,170	98,855
ST. GEORGE ISLAND.				
North.....	Aug. 6.....	6,122	124	6,246
Staraya Artil.....	do.....	5,460	85	5,545
Zapadni.....	Aug. 7.....	957	8	965
South.....	do.....	19		19
East Reef.....	Aug. 5.....	1,568	17	1,585
East Cliffs.....	do.....	3,684	78	3,762
Total.....		17,810	312	18,122
St. Paul Island.....		96,685	2,170	98,855
St. George Island.....		17,810	312	18,122
Total, both islands.....		114,495	2,482	116,977

## PERCENTAGE OF INCREASE OR DECREASE IN THE NUMBER OF PUPS IN 1916 FROM 1915.

Rookery.	Total pups, 1915.	Total pups, 1916.	Percentage of increase (+) or de- crease (-).
ST. PAUL ISLAND.			
Kitovi.....	2,475	2,472	- 0.12
Lukanin.....	1,954	2,141	+ 9.57
Gorbach.....	6,978	8,864	+27.02
Ardiguen.....	632	700	+10.75
Reef.....	14,750	16,331	+10.71
Sivutch.....	4,535	5,020	+10.69
Lagoon.....	394	388	- 1.52
Tolstoi.....	11,623	12,065	+ 3.80
Zapadni.....	8,740	9,682	+10.77
Little Zapadni.....	5,682	6,277	+10.47
Zapadni Reef.....	219	266	+21.46
Polovina.....	4,161	4,744	+14.01
Polovina Cliffs.....	1,553	1,683	+ 8.37
Little Polovina.....	1,065	1,074	+ .84
Morjovi.....	2,395	2,761	+15.28
Vostochni.....	20,981	24,387	+16.23
Total.....	88,137	98,855	+12.16
ST. GEORGE ISLAND.			
North.....	5,731	6,246	+ 8.98
Staraya Artil.....	4,450	5,545	+24.60
Zapadni.....	989	965	- 2.42
South.....	26	19	-26.92
East Reef.....	1,047	1,585	+51.38
East Cliffs.....	3,147	3,762	+19.54
Total.....	15,390	18,122	+17.75
St. Paul Island.....	88,137	98,855	+12.16
St. George Island.....	15,390	18,122	+17.75
Total, both islands.....	103,527	116,977	+12.99

## PERCENTAGE OF ANNUAL INCREASE OF PUPS, 1912 TO 1916.

Year.	Number of pups.	Percentage of increase.
1912.....	81,984	-----
1913.....	92,269	12.54
1914.....	93,250	1.06
1915.....	103,527	11.02
1916.....	116,977	12.99

These figures suggest that the normal rate of increase is about 12 per cent. No good reason is known for the small percentage of increase in 1914.

The dead pups were counted at the same time as the live ones. In 1916 the proportion of dead pups to the total number born was somewhat larger than in previous years. No evidence of *Uncinaria* was seen. Mange, which was observed on a large number of pups in 1915, appeared to a lesser extent in 1916.

## NUMBER AND DISTRIBUTION OF DEAD PUPS IN 1916.

Rookery.	Total pups.	Dead pups.	Percentage of dead.	
			1916	1915
ST. PAUL ISLAND.				
Kitovi.....	2,472	27	1.09	1.86
Lukanin.....	2,141	86	4.01	1.43
Gorbatch.....	8,864	252	2.84	1.37
Ardiguen.....	700	7	1.00	1.42
Reef.....	16,331	183	1.12	1.65
Sivutch.....	5,020	69	1.37	1.23
Lagoon.....	388	3	.77	1.78
Tolstoi.....	12,065	146	1.21	1.05
Zapadni.....	9,682	147	1.51	2.10

## NUMBER AND DISTRIBUTION OF DEAD PUPS IN 1916—Continued.

Rookery.	Total pups.	Dead pups.	Percentage of dead.	
			1916	1915
ST. PAUL ISLAND—continued.				
Little Zapadni.....	6,277	150	2.38	1.69
Zapadni Reefs.....	266	4	1.50	1.37
Polovina.....	4,744	113	2.38	1.73
Polovina Cliffs.....	1,683	20	1.18	.58
Little Polovina.....	1,074	15	1.39	1.13
Morjovi.....	2,761	44	1.59	1.58
Vostochni.....	24,387	904	3.70	2.75
Total.....	98,855	2,170	2.19	1.82
ST. GEORGE ISLAND.				
North.....	6,246	124	1.98	1.90
Staraya Artil.....	5,545	85	1.53	1.19
Zapadni.....	965	8	.82	1.11
South.....	19			
East Reef.....	1,585	17	1.07	.28
East Cliffs.....	3,762	78	2.07	.89
Total.....	18,122	312	1.72	1.32
St. Paul Island.....	98,855	2,170	2.19	1.82
St. George Island.....	18,122	312	1.72	1.32
Total, both islands.....	116,977	2,482	2.12	1.74

The number of pups which were killed as a result of counting this class of animals was 27. It was impossible to control the pups so as to obviate all danger to them, part of the difficulty arising from the large number of vicious bulls present. The proportion of those killed in taking the census to the number born was less than 1 to 4,000.

## LOCATION AND NUMBER OF PUPS WHICH DIED AS DIRECT RESULT OF COUNT IN 1916.

Rookery.	Number killed.	Cause.
Lukanin (St. Paul).....	1	Smothering.
Reef (St. Paul).....	1	Trampling by bull.
Do.....	16	Drowning and smothering.
Tolstoi (St. Paul).....	2	Smothering.
Do.....	2	Drowning.
Polovina (St. Paul).....	1	Smothering.
Vostochni (St. Paul).....	2	Do.
East Cliffs (St. George).....	2	Drowning.
Total.....	27	

*Breeding cows.*—This class of seals is made up of females 3 years of age and upward. Since no cow gives birth to more than one pup in a year, the number of animals in this class in a given year can not be less than the number of pups born that year. The number of pups born in 1916 was found to be 116,977, which may be taken as the number of breeding cows. While taking the pup census, 79 dead cows were found.

Considerable numbers of cows which were branded in 1912, when they were pups, were seen on the rookeries in 1916.

*Harem bulls and idle bulls.*—The counts of these animals on the rookeries were made for St. Paul Island on July 16, 17, 18, and 19 and for St. George Island on July 19 and 20. The dates on which the corresponding counts were made in 1915 were July 17, 18, 19, and 21 and July 19 and 20. The close correspondence of the dates makes the results properly comparable.

The counting of the bulls was attended with considerable difficulty and danger, and resort was had to various methods of procedure in order to secure accurate results. A great deal of fighting among the bulls was observed on all the rookeries.

The boundaries of the breeding areas were plotted on Coast and Geodetic Survey charts.

## HAREM AND IDLE BULLS IN 1916.

Rookery.	Date.	Harem bulls.	Idle bulls.	Total.
ST. PAUL ISLAND.				
Kitovi.....	July 16	95	44	139
Lukanin.....	do.....	64	45	109
Gorbatch.....	July 17	234	110	344
Ardiguen.....	do.....	33	9	42
Reef.....	do.....	490	269	759
Sivutch.....	do.....	162	111	273
Lagoon.....	July 18	13	8	21
Tolstoi.....	do.....	361	335	696
Zapadni.....	do.....	309	332	641
Little Zapadni.....	do.....	178	157	335
Zapadni Reef.....	do.....	8	1	9
Polovina.....	July 19	162	90	252
Polovina Cliffs.....	do.....	59	47	106
Little Polovina.....	do.....	31	21	52
Morjovi.....	do.....	95	88	183
Vostochni.....	do.....	654	611	1,265
Total.....		2,948	2,278	5,226
ST. GEORGE ISLAND.				
North.....	July 20	200	103	303
Staraya Artil.....	do.....	142	109	251
Zapadni.....	July 19	31	47	78
South.....	do.....	3	.....	3
East Reef.....	July 20	73	44	117
East Cliffs.....	do.....	103	51	154
Total.....		552	354	906
St. Paul Island.....		2,948	2,278	5,226
St. George Island.....		552	354	906
Total, both islands.....		3,500	2,632	6,132

## COMPARISON OF HAREM AND IDLE BULLS IN 1916 WITH 1915.

Rookery.	Harem bulls.			Idle bulls.			Total.		
	1915	1916	Gain.	1915	1916	Gain.	1915	1916	Gain.
ST. PAUL ISLAND.									
Kitovi.....	67	95	<i>Per ct.</i>	24	44	<i>Per ct.</i>	91	139	<i>Per ct.</i>
Lukanin.....	46	64	39.13	18	45	150.00	64	109	70.31
Gorbatch.....	152	234	53.94	35	110	214.28	187	344	83.95
Ardiguen.....	25	33	32.00	6	9	50.00	31	42	35.48
Reef.....	294	490	66.66	59	269	355.93	353	759	115.01
Sivutch.....	96	162	68.75	23	111	382.60	119	273	129.41
Lagoon.....	15	13	<i>a</i> 13.33	4	8	100.00	19	21	10.52
Tolstoi.....	237	361	52.32	46	335	628.26	283	696	145.93
Zapadni.....	173	309	78.61	92	332	260.86	265	641	141.88
Little Zapadni.....	106	178	67.92	26	157	503.84	132	335	153.78
Zapadni Reef.....	7	8	14.28	1	<i>a</i> 83.33	.....	13	9	<i>a</i> 30.76
Polovina.....	70	162	131.42	31	90	190.32	101	252	149.50
Polovina Cliffs.....	33	59	78.78	11	47	327.27	44	106	140.90
Little Polovina.....	21	31	47.62	9	21	133.33	30	52	73.33
Morjovi.....	51	95	86.27	21	88	319.04	72	183	154.16
Vostochni.....	396	654	65.15	135	611	352.59	531	1,265	138.22
Total.....	1,789	2,948	64.78	546	2,278	317.21	2,335	5,226	123.81
ST. GEORGE ISLAND.									
North.....	141	200	41.84	53	103	94.33	194	303	56.18
Staraya Artil.....	89	142	59.55	31	109	251.61	120	251	109.16
Zapadni.....	23	31	34.78	10	47	370.00	33	78	136.36
South.....	3	3	.....	.....	.....	.....	3	3	.....
East Reef.....	30	73	143.33	18	44	144.44	48	117	143.75
East Cliffs.....	76	103	35.52	15	51	240.00	91	154	69.23
Total.....	362	552	52.48	127	354	178.74	489	906	85.27
St. Paul Island.....	1,789	2,948	64.78	546	2,278	317.21	2,335	5,226	123.81
St. George Island.....	362	552	52.48	127	354	178.74	489	906	85.27
Total, both islands.....	2,151	3,500	62.71	673	2,632	291.08	2,824	6,132	117.13

*a* Loss.



*The average harem.*—The average number of breeding cows in the harems for the entire herd, or for subdivisions thereof, may be ascertained by dividing the number of breeding cows, which is equal to the number of pups, as ascertained by count, by the number of harem bulls present on the area considered. In 1914 the number of cows in the average harem, for the herd as a whole, was 59.8; in 1915, 48.13; and in 1916, 33.42.

The following table shows the size of the average harem, together with the percentage of idle bulls to harem bulls for the herd and for various subdivisions thereof in 1915 and 1916:

AVERAGE HAREM AND PERCENTAGE OF IDLE BULLS TO HAREM BULLS, 1915 AND 1916.

Rookery.	1915				1916			
	Breed- ing cows.	Harem bulls.	Aver- age harem.	Percent- age idle bulls to harem bulls.	Breed- ing cows.	Harem bulls.	Aver- age harem.	Percent- age idle bulls to harem bulls.
ST. PAUL ISLAND.								
Kitovi.....	2,475	67	36.9	35.8	2,472	95	26.0	46.3
Lukanin.....	1,954	46	42.5	39.1	2,141	64	33.4	70.3
Gorbach.....	6,978	152	45.9	23.0	8,864	234	37.9	47.0
Ardiguen.....	632	25	25.3	24.0	700	33	21.2	27.3
Reef.....	14,750	294	50.2	20.0	16,331	490	33.3	54.9
Sivutch.....	4,535	96	47.3	23.9	5,020	162	31.0	68.5
Lagoon.....	394	15	26.3	26.7	388	13	29.8	61.5
Tolstoi.....	11,623	237	49.0	19.4	12,065	361	33.4	92.8
Zapadni.....	8,740	173	50.5	53.2	9,682	309	31.3	107.4
Little Zapadni.....	5,682	106	53.6	24.5	6,277	178	35.3	88.2
Zapadni Reef.....	219	7	31.3	85.7	266	8	33.2	12.5
Polovina.....	4,161	70	59.4	44.3	4,744	162	29.3	55.5
Polovina Cliffs.....	1,553	33	47.1	33.3	1,683	59	28.5	79.7
Little Polovina.....	1,065	21	50.7	42.9	1,074	31	34.6	67.7
Morjovi.....	2,395	51	46.9	41.2	2,761	95	29.1	92.6
Vostochni.....	20,981	396	53.0	34.1	24,387	654	37.3	93.4
Total.....	88,137	1,789	49.27	30.52	98,855	2,948	33.53	77.27
ST. GEORGE ISLAND.								
North.....	5,731	141	40.6	37.6	6,246	200	31.2	51.5
Staraya Artil.....	4,450	89	50.0	34.8	5,545	142	39.0	76.8
Zapadni.....	989	23	43.0	43.5	965	31	31.1	151.6
South.....	26	3	8.7	-----	19	3	6.3	-----
East Reef.....	1,047	30	34.9	60.0	1,585	73	21.7	60.3
East Cliffs.....	3,147	76	41.4	19.7	3,762	103	36.5	49.5
Total.....	15,390	362	42.51	35.08	18,122	552	32.82	64.13
St. Paul Island.....	88,137	1,789	49.27	30.52	98,855	2,948	33.53	77.27
St. George Island.....	15,390	362	42.51	35.08	18,122	552	32.82	64.13
Total, both islands.....	103,527	2,151	48.13	31.28	116,977	3,500	33.42	75.20

*Yearlings.*—Few yearlings were noted at the islands in 1916 prior to August 20. Many were smaller in body than the pups at the time the latter were just beginning to acquire the silvery gray pelage.

The number of yearlings in 1916 was calculated by making certain deductions from the number of pups born in 1915, as will be shown later in the statement of the complete census.

*Two-year-olds.*—The number of animals in this class was calculated by making certain deductions from the number of yearlings in the herd in 1915.

*Three, four, five, and six year old males.*—The number of animals in each of these four classes was also calculated from the 2, 3, 4, and 5 year old male classes, respectively, of the previous year. In determining the 4, 5, and 6 year old classes, no deductions

were made for natural mortality in the preceding year. This loss is known to be small and is believed to be more than offset by ample deductions made for the first three years in the life of these seals.

*Bachelor and young bull counts.*—At the time of the height-of-the-season harem counting the seals on the several hauling grounds were counted, and the area occupied by them was plotted on Coast and Geodetic Survey charts. This area was found to have increased to a large extent over that of the previous year.

The enumeration of hauling-ground seals must be considered in the light of a check upon other methods of computation rather than as a method of obtaining definite figures. In the first place the counts can not be made simultaneously on all the rookeries unless more assistance be provided than is now available, and, secondly, precise information is not at hand as to the percentage of these seals which are on land at any one time. It was formerly believed that only about 20 per cent of the bachelors were on land at one time. If this be a correct assumption it would appear that the number of bachelors and young bulls deduced from the known birth rates is less than the number which actually exists and is, therefore, on the side of safety.

#### COMPLETE CENSUS OF FUR SEALS IN 1916.

Pups, as per count July 26 to August 15.....	116, 977	
Breeding cows, 3 years of age and over.....	116, 977	
Harem bulls, in active service, as per counts July 16 to 20.....	3, 500	
Idle bulls, in position for harem service but without cows, as per counts July 16 to 20.....	2, 632	
Yearlings, male and female:		
Pups, both sexes, born in 1915.....	103, 527	
Deduction for natural mortality in first year, 35 per cent.....	36, 234	
Yearlings, both sexes, in 1916.....	67, 293	
Yearling females, one-half of total yearlings.....	33, 646	33, 646
Yearling males, one-half of total yearlings.....	33, 647	
Yearling males killed in 1916.....	2	
Yearling males, Aug. 10, 1916.....		33, 645
2-year-olds, male and female:		
Pups, both sexes, born in 1914.....	93, 250	
Deduction for natural mortality in first year, 35 per cent.....	32, 637	
Yearlings, both sexes, in 1915.....	60, 613	
Deduction for males, 50 per cent.....	30, 307	
Yearling females in 1915.....	30, 306	
Deduction for natural mortality in second year, 20 per cent....	6, 061	
2-year-old females in 1916.....		24, 245
Yearling males in 1915.....	30, 307	
Yearling males killed in 1915.....	2	
Yearling males at close of 1915.....	30, 305	
Deduction for natural mortality in second year, 20 per cent....	6, 061	
2-year-old males in 1916.....		24, 244
2-year-old males killed in 1916.....	75	
2-year-old males, Aug. 10 1916.....		24, 169

## 3-year-old males:

Pups, both sexes, born in 1913.....	92,269
Deduction for natural mortality in first year, 35 per cent.....	32,294
Yearlings, both sexes, in 1914.....	59,975
Deduction for females, 50 per cent.....	29,988
Yearling males in 1914.....	29,987
Deduction for natural mortality in second year, 20 per cent....	5,997
2-year-old males in 1915.....	23,990
2-year-old males killed in 1915.....	353
2-year-old males at close of 1915.....	23,637
Deduction for natural mortality in third year, 4 per cent.....	945
3-year-old males in 1916.....	22,692
3-year-old males killed in 1916.....	3,290

3-year-old males, Aug. 10, 1916..... 19,402

## 4-year-old males:

Pups, both sexes, born in 1912.....	81,984
Deduction for natural mortality in first year, 35 per cent.....	28,694
Yearlings, both sexes, in 1913.....	53,290
Deduction for females, 50 per cent.....	26,645
Yearling males in 1913.....	26,645
Yearling males killed in 1913.....	5
Yearling males at close of 1913.....	26,640
Deduction for natural mortality in second year, 20 per cent....	5,328
2-year-old males in 1914.....	21,312
2-year-old males killed in 1914.....	16
2-year-old males at close of 1914.....	21,296
Deduction for natural mortality in third year, 4 per cent.....	852
3-year-old males in 1915.....	20,444
3-year-old males killed in 1915.....	3,056
3-year-old males at close of 1915.....	17,388
No deduction for mortality in fourth year.	
4-year-old males in 1916.....	17,388
4-year-old males killed in 1916.....	1,961

4-year-old males, Aug. 10, 1916..... 15,427

## 5-year-old males:

Pups, both sexes, born in 1911 <sup>a</sup> .....	75,000
Deduction for natural mortality in first year, 35 per cent.....	26,250
Yearlings, both sexes, in 1912.....	48,750
Deduction for females, 50 per cent.....	24,375
Yearling males in 1912.....	24,375
Deduction for natural mortality in second year, 20 per cent....	4,875
2-year-old males in 1913.....	19,500

<sup>a</sup> Bureau of Fisheries document No. 820, p. 35.

## 5-year-old males—Continued.

Deduction for natural mortality in third year, 4 per cent.....	780	
3-year-old males in 1914.....	18,720	
3-year-old males killed in 1914.....	2,872	
3-year-old males at close of 1914.....	15,848	
No deduction for mortality in fourth year.		
4-year-old males in 1915.....	15,848	
4-year-old males killed in 1915.....	297	
4-year-old males at close of 1915.....	15,551	
No deduction for mortality in fifth year.		
5-year-old males in 1916.....	15,551	
5-year-old males killed in 1916.....	57	
5-year-old males, Aug. 10, 1916.....		15,494
3-year-old males:		
5-year-old males in 1915 <sup>a</sup> .....	11,271	
5-year-old males killed in 1915.....	99	
6-year-old males in 1916.....	11,172	
6-year-old males killed in 1916.....	5	
6-year-old males, Aug. 10, 1916.....		11,167
<i>Recapitulation:</i>		
Pups.....	116,977	
Breeding cows.....	116,977	
Harem bulls.....	3,500	
Idle bulls.....	2,632	
Yearling females.....	33,646	
Yearling males.....	33,645	
2-year-old females.....	24,245	
2-year-old males.....	24,169	
3-year-old males.....	19,402	
4-year-old males.....	15,427	
5-year-old males.....	15,494	
6-year-old males.....	11,167	
Total, all classes.....		417,281

## BRANDED SEALS.

The seals branded when pups in 1912 continue to furnish valuable information along lines which require that animals whose ages are definitely known shall be available.

On St. George Island in the period from June 9 to August 10, 1916, both dates inclusive, there were observed in various drives 198 male seals bearing the 1912 brand. Of these 30 were killed. In order that no branded seal might be counted more than once each one of those not killed was when first counted marked by clipping the hair and fur from the left side of the head. When one of these clipped seals appeared in a subsequent drive, a record was made of

the occurrence, and a total of 46 were so recorded. Branded animals were observed in nearly every drive. In the course of observations made on the rookeries on St. George Island in 1916, cows bearing the 1912 brand were seen in the harems in considerable numbers.

There were included in the 1916 shipment of sealskins from the Pribilofs 96 of these branded skins. After they had been received by Funsten Bros. & Co. at St. Louis additional records were made. The following table shows certain data secured at the Pribilof Islands and at St. Louis in regard to them and supplements similar data published in the corresponding report on the Alaska Fisheries and Fur Industries in 1915:

DATA ON CERTAIN MALE SEALS KILLED, 1913 TO 1916, BRANDED AS PUPS IN 1912.  
YEARLINGS.

Serial No. of skins.	Date of killing.	Island.	Carcass weight. <sup>a</sup>	Carcass length.	Green-skin weight.		Salt-skin weight. <sup>b</sup>		Effect of salt.		Salt-skin length. <sup>b</sup>	Salt-skin width. <sup>b</sup>	Trade classification. <sup>b</sup>
					Pounds.	Ounces.	Pounds.	Ounces.	Gain.	Loss.			
TWO-YEAR-OLD.													
G 5160 c. d. ....	July 9, 1914	St. George. ....	57.75	42	5	7	6	13	.....	22	36	24	Middling pup.
THREE-YEAR-OLDS.													
P 8477. ....	Oct. 21, 1915	St. Paul. ....	68.50	43	6	13	6	3.75	.....	.....	38	29.5	Small seal.
P 8478. ....	do. ....	do. ....	67	45.50	6	5	7	15.50	.....	.....	37.50	29.75	Do.
P 8479. ....	do. ....	do. ....	94	49	7	13	7	4.50	.....	.....	38.50	28	Do.
P 8480. ....	do. ....	do. ....	68	45.75	6	7	6	2.25	.....	.....	35	27.5	Large pup.
P 8481. ....	do. ....	do. ....	80.50	46	6	2	6	9	.....	.....	36	30	Do.
P 8482. ....	do. ....	do. ....	66	42	7	.....	6	4.75	.....	.....	34.50	27.50	Do.
P 8626. ....	Oct. 26, 1915	do. ....	66	45.50	7	9	6	14.50	.....	.....	38.50	28.25	Small seal.
P 8627. ....	do. ....	do. ....	75	44.25	7	7	6	13	.....	.....	38.50	29.25	Do.
P 8628. ....	do. ....	do. ....	58.50	43	6	7	6	.75	.....	.....	37	27.50	Large pup.
P 8629. ....	do. ....	do. ....	59.50	43.75	6	6	6	.25	.....	.....	37	30.25	Small seal.
P 8630. ....	do. ....	do. ....	65.50	42.25	6	12	6	5.50	.....	.....	37	27.50	Large pup.
P 8631. ....	do. ....	do. ....	69.50	43.50	6	15	6	5.25	.....	.....	37	30.25	Small seal.
P 8632. ....	do. ....	do. ....	60	40	6	14	8	5.75	.....	.....	37	28.25	Do.
P 8633. ....	do. ....	do. ....	74.50	47.75	8	8	6	2.75	.....	.....	32.50	28.50	Middling pup.
P 8753. ....	Nov. 3, 1915	do. ....	62	44	6	7	8	8.50	.....	.....	33.25	32.5	Do.
P 8754. ....	do. ....	do. ....	53	43.75	7	4	6	9.75	.....	.....	33.25	32.5	Middling and small.
P 9074. ....	Nov. 11, 1915	do. ....	95.75	46	9	11.25	10	13.75	.....	.....	36	28.75	Large pup.
P 9630. ....	Dec. 3, 1915	do. ....	76	48.25	8	1.75	7	9.75	.....	.....	34.50	28.50	Do.
								.25	5	8	38.25	30.75	Small seal.
								9.75	.....	.....	42	29.75	Middling and small.

## FOUR-YEAR-OLDS.

	June 3, 1916	St. Paul.		49.25	8	11	8	12	8	7.75	3.25	38.25	28.50	Small seal.
P 9978.....	do.	do.	73	50	12	8	7	12	9.50	1.50	45	45	27	Middling.
P 9979.....	do.	do.	103	45.25	7	.....	.....	6	13.75	.....	2.25	40.75	27	Small seal.
P 9980.....	do.	do.	62	47.25	8	11	.....	9	.....	5	.....	39.50	27.25	Do.
P 9981.....	do.	do.	90	48.50	9	4	.....	10	14.50	.....	1	39	31	Middling and small.
P 9982.....	do.	do.	85	51.50	11	2	.....	10	4.25	.....	3.50	44.75	31.50	Do.
P 9983.....	do.	do.	102	50.50	10	8	.....	11	2.75	.....	3.75	43.75	31.25	Middling.
P 9984.....	do.	do.	92	47	11	1	.....	10	2.50	1.75	6.50	41	30.25	Middling and small.
P 9985.....	do.	do.	100	50.75	10	9	.....	10	10	.....	2	42.50	33	Do.
P 9986.....	do.	do.	90	47.50	11	12	.....	11	10	.....	.....	44.75	31	Do.
P 9987.....	do.	do.	91	48.75	9	10	.....	9	6.75	.....	4.25	44.75	31	Small seal.
P 9988.....	do.	do.	78	55	7	11	.....	7	4.50	1.50	.....	33.75	27.75	Middling pup.
P 9989.....	do.	do.	73	49.25	7	3	.....	7	7	6	.....	39.25	30.75	Small seal.
P 10200.....	June 12, 1916	do.	80	43.75	8	1	.....	8	7	.....	.....	39	33.50	Middling and small.
P 10201.....	do.	do.	87	48.75	9	.....	.....	8	10	.....	6	41.75	34	Do.
P 10202.....	do.	do.	95	51	10	9.50	.....	10	12	.....	3	37.75	30	Large pup.
P 10203.....	do.	do.	81	50	8	.....	.....	7	14.75	.....	1.25	35.25	31	Do.
P 10204.....	June 23, 1916	do.	81.75	50.50	8	8	.....	8	4.50	.....	3.50	35	27.50	Small pup.
P 10205.....	do.	do.	70.50	45	7	8	.....	7	2.75	.....	5.25	32	27.25	Large pup.
P 10206.....	do.	do.	76.50	42.75	7	10	.....	7	14.50	4.50	.....	39	29	Middling and small.
P 10628.....	June 30, 1916	do.	84	50	8	13	.....	8	15.50	2.50	.....	37.75	30	Small seal.
P 10629.....	do.	do.	84	50.50	8	14	.....	8	15.75	1.75	.....	37.75	29.25	Do.
P 10630.....	do.	do.	90	48.50	8	6	.....	8	4.25	.....	2.25	39	31.25	Middling and small.
P 10631.....	do.	do.	84	50.50	8	14	.....	8	11.75	1.75	.....	43.25	35	Middling.
P 10632.....	do.	do.	98	50.50	9	13	.....	9	14.75	16.75	.....	36.75	29	Large pup.
P 11013.....	July 10, 1916	do.	84	48	7	8	.....	8	8.75	.....	1.50	37.50	32.50	Small seal.
P 11014.....	do.	do.	74	48	9	.....	.....	7	14.50	.....	.....	37.50	32.50	Do.
P 11015.....	do.	do.	96	50	9	.....	.....	9	4	4	.....	33	26.25	Middling pup.
P 11016.....	do.	do.	55	40	6	4	.....	6	4	1	.....	34.50	27.25	Large pup.
P 11017.....	do.	do.	85	51	9	.....	.....	9	1	1	.....	34	27.25	Middling pup.
P 11018.....	do.	do.	78.50	48.50	8	.....	.....	8	10.75	10.75	.....	31.50	26.25	Small pup.
P 11019.....	do.	do.	65.50	42	7	.....	.....	7	15	15	.....	37.50	28.50	Small seal.
P 11497.....	July 15, 1916	do.	86	48.50	10	.....	.....	9	14.75	.....	1.25	44	31.50	Middling.
P 11498.....	do.	do.	105	51	11	.....	.....	11	2.50	2.50	.....	40.25	28.50	Small seal.
P 11499.....	do.	do.	92	50	9	.....	.....	9	5.75	5.75	.....	40.25	28.25	Large pup.
P 11500.....	do.	do.	91	46	8	.....	.....	8	13.75	.....	25	36	29	Small seal.
P 11595.....	July 22, 1916	do.	80	47.50	8	8	.....	8	4.50	.....	3.50	39.25	27.25	Large pup.
P 11596.....	do.	do.	101	51	9	.....	.....	8	11.75	.....	4.25	34.25	32.25	Small seal.
P 11597.....	do.	do.	106	51	10	8	.....	10	6.75	.....	1.25	39.75	28.50	Do.
P 11598.....	do.	do.	78	49	8	.....	.....	8	15	.....	1	38	32	Large pup.
P 12072.....	July 26, 1916	do.	87	47	9	.....	.....	8	8.50	.....	7.50	34.50	30	Do.
P 12256.....	July 29, 1916	do.	94.50	48.50	10	.....	.....	8	7.50	.....	8.50	36	30	Do.
P 12498.....	Aug. 1, 1916	do.	71.50	48.50	9	.....	.....	9	.....	.....	37	30	30	Do.

<sup>a</sup> Carcass weights of seals killed on St. George Island in 1913 and 1914 were obtained before the seals were bled; in 1915 and 1916, after the seals were bled.

<sup>b</sup> The salt-skin weights, salt-skin lengths, salt-skin widths, and trade classifications were obtained at St. Louis, Mo., in January, 1917.

<sup>c</sup> The skins bearing tag numbers G 5157, G 5158, G 5159, and G 5160 were referred to in the corresponding table in the report of the Alaska Fisheries and Fur Industries for 1915 as not having been shipped from St. George Island. These skins were forwarded in the 1916 shipment, hence complete data are now available as above indicated.

<sup>d</sup> Green-skin weight of skins bearing tag numbers G 5155 and G 5160 includes mask.

DATA ON CERTAIN MALE SEALS KILLED, 1913 TO 1916, BRANDED AS PUPS IN 1912—Continued.

Serial No. of skins,	Date of killing.	Island.	Carcass weight, <sup>a</sup> Pounds.	Carcass length, Inches.	Green-skin weight.		Salt-skin weight, <sup>b</sup>		Effect of salt.		Salt-skin length, <sup>b</sup> Inches.	Salt-skin width, <sup>b</sup> Inches.	Trade classification, <sup>b</sup>
					Pounds.	Ounces.	Pounds.	Ounces.	Gain.	Loss.			
P 12676	Aug. 11, 1916	St. Paul	105.50	53	10	.....	9	12	.....	4	37	31.25	Small seal.
G 3651	June 24, 1916	St. George	94.50	48	11	.....	11	3.25	2.25	.....	39	27	Do.
G 3652	.....	.....	80.50	47.50	13	4	12	12.25	.....	7.75	37	38.75	Large pup.
G 3653	.....	.....	100	50	10	.....	10	3.25	3.25	.....	38.50	29	Small seal.
G 3851	June 27, 1916	.....	90.50	44	10	12	10	14.25	2.25	.....	37	30	Large pup.
G 3852	.....	.....	104.25	53	12	12	12	7.25	.....	4.75	42	30	Middling and small.
G 3853	.....	.....	91.25	49	11	4	11	12.25	8.25	.....	43.50	28.25	Do.
G 3854	.....	.....	61	42.50	8	8	9	.....	1	.....	38.25	27	Large pup.
G 3903	June 29, 1916	.....	79	48	11	2	12	.....	14.25	.....	41	28	Small seal.
G 3904	.....	.....	70.50	45.50	9	.....	9	9.50	3.25	.....	41	27	Do.
G 3905	.....	.....	76.25	48	9	.....	9	15.25	.....	.....	41.75	26.50	Do.
G 3906	.....	.....	101.50	49.50	11	5	11	13	8	.....	41.25	28.50	Middling and small.
G 3907	.....	.....	102	45	10	4	14	2.50	.....	.....	42.50	30	Do.
G 3908	.....	.....	79	45.50	10	15	11	1.25	2.25	.....	41	27	Small seal.
G 4019	July 1, 1916	.....	89	48.75	15	12	15	7.25	.....	4.75	38.75	27	Do.
G 4020	.....	.....	102.75	48	16	10	16	2	.....	8	37.75	27.50	Do.
G 4021	.....	.....	84	47	12	.....	11	9	.....	9.75	39.75	29.50	Do.
G 4022	.....	.....	99	48	13	.....	17	6.25	7.25	23	36	30	Middling and small.
G 4023	.....	.....	79.50	50	11	8	11	15.25	11	.....	36.50	28	Large pup.
G 4301	July 7, 1916	.....	84	46.25	10	4	10	15	.....	.....	37	26	Do.
G 4302	.....	.....	83	46	11	6	11	6.50	.50	.....	40	27.50	Do.
G 4370	.....	.....	85.50	50	14	2	13	6.50	.....	11.50	39	29	Small seal.
G 4371	.....	.....	90	47.50	12	2	11	2.25	10	.....	38.75	25.50	Large pup.
G 4372	.....	.....	66.50	46	9	4	10	2.25	14.25	.....	38.25	26	Do.
G 4373	.....	.....	98.50	52	10	6	11	1.75	11.75	.....	38.25	28.50	Small seal.
G 4664	.....	.....	86.50	43	11	.....	12	5.75	17	.....	38	27	Large pup.
G 4665	.....	.....	81	46	11	12	19	3.75	9.75	.....	38.50	26.25	Do.
G 4666	.....	.....	102.50	48.75	12	2	12	1.25	.....	.75	38.50	26.25	Large pup.
G 4667	.....	.....	84	46.75	8	4	9	3.75	15.75	.....	37	23.25	Do.
G 4668	.....	.....	68	44.75	9	2	9	11.75	9.75	.....	35	26.25	Do.
G 4623	July 15, 1916	.....	79.25	45	9	8	9	7	.....	1	32.50	24	Middling pup.

<sup>a</sup> Carcass weights of seals killed on St. George Island in 1916 were obtained after the seals were bled.<sup>b</sup> The salt-skin weights, salt-skin lengths, and trade classifications were obtained at St. Louis, Mo., January, 1917.



## FOXES.

The size of the blue-fox herds on St. Paul and St. George Islands remains fairly constant from year to year. The pelts generally become prime on both islands in the latter part of November and the pelage is at its best in December. The general method of taking foxes for the pelts by means of a large wire cage operated in connection with a house in which the animals are fed on St. George Island and by means of steel traps on St. Paul Island has been continued.<sup>a</sup>

Increased efforts to eliminate the white foxes from the herds have been made by allowing the natives, beginning with the season of 1915-16, the same credit for taking a white-fox pelt as for taking a more valuable blue-fox pelt.

The killing of foxes in the season of 1915-16 was continued into January, 1916, on St. Paul Island only, 22 blue foxes and 1 white fox having been killed in that month.

In the season of 1916-17 the killing of foxes was begun on St. George Island in November and on St. Paul Island in the latter part of December. Through December 31, 1916, 238 blue foxes and 2 white foxes had been taken on St. George and 83 blues and 21 whites on St. Paul. Telegraphic advices indicate that for the season 150 blue-fox pelts and 37 white-fox pelts were taken on St. Paul Island (including 1 blue and 1 white pelt taken from foxes found dead in February, 1917) and 417 blue-fox pelts and 2 white-fox pelts on St. George Island, or a total of 567 blues and 39 whites. These numbers make the season's take the largest of any in recent years.

*Foxes supplied for breeding purposes.*—In response to a request made by the Bureau of Biological Survey, Department of Agriculture, the Bureau of Fisheries agreed to furnish the Biological Survey with six pairs of blue foxes for use on an experimental fox farm located in the State of New York. The foxes were captured on St. George Island and were placed aboard the Bureau's supply vessel for transportation to Seattle. With the exception of two which died en route the animals were delivered at Seattle to an agent of the Bureau of Biological Survey. Along with these foxes there were shipped from St. George five other blue foxes, one of which died before reaching Seattle.

## REINDEER.

In order that the herds may be brought into more definite relation with the general organization of the Department's activities on the islands, general plans for their future management were prepared early in 1916. The plans in part contemplate (1) the construction of suitable stone corrals, (2) the branding of animals, (3) the maintenance of a proper proportion of the two sexes, (4) the utilization of

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<sup>a</sup> Details of the method appear in Bureau of Fisheries Document No. 820, p. 112.

animals for food, (5) the exchange of breeding animals between the two islands in order to maintain virility and prevent too close inbreeding, and (6) the utilization of skins.

*St. George Island.*—A census taken in August, 1916, showed that the herd on this island consisted of 31 fawns and 54 others aged 1 year and upward. In the early part of 1916 two males were killed and the meat distributed, principally among the native families. One of the reindeer dressed 204 pounds, the other 158 pounds.

It was not possible to undertake the building of a corral on St. George until in October when one was begun.

*St. Paul Island.*—The press of other work curtailed the amount of attention which it had been hoped could be given to the herd on this island. At the end of the year the herd numbered at least 111.

#### RADIO SERVICE.

Radio stations were maintained on St. Paul and St. George Islands by the Navy Department throughout the year. These stations render valuable assistance to the Bureau. For several months each year no other means of communicating with the islands are available.

In June various repairs and improvements were made by the Navy Department to the St. Paul radio station. Among these were the building of a tramway which, in connection with an extension made by the Bureau of Fisheries, will be of considerable use in the handling of sealskins and supplies. Natives were given employment by the Navy Department at the rate of 25 cents per hour, earning thereby over \$750.

Employees at the radio station on St. Paul cooperated with the Bureau in many ways, including the overhauling and repairing of machinery and the pumping of water to the tanks from which the village of St. Paul is supplied. At the time the supply ship was being discharged two electricians were detailed to operate the launches used for towing the bidarras and skiffs in which supplies were transferred from the supply ship to the island and a third was detailed to operate a radio outfit which was temporarily installed on the ship. This temporary station was kept in operation throughout the period the cargo was being discharged at both islands and assisted materially in reducing the time required for the work.

At St. George Island natives were given employment by the Navy Department, for which they received about \$240. During the year the employees of the Bureau and the Navy Department cooperated in various ways, to the advantage of both. Through the courtesy of the Navy Department a quantity of freight was transported from St. Paul to St. George.

**PATROL OF THE NORTH PACIFIC OCEAN AND BERING SEA.**

As in previous years, vessels of the Coast Guard exclusively were detailed to patrol the North Pacific Ocean and Bering Sea for the protection of the fur seals and sea otters in the season of 1916. This patrol work is required by section 9 of the act of Congress approved August 24, 1912, giving effect to the North Pacific Sealing Convention of July 7, 1911. The group of vessels detailed for the work is known as the Bering Sea fleet. In the season of 1916 the fleet consisted of the *Unalga*, the *Manning*, and the *McCulloch*. The commanding officer of the fleet was authorized to direct the cutter *Bear*, which was designated for the usual cruise in the Arctic Ocean, to perform any duty that would not interfere with her orders from headquarters for the Arctic cruise.

In addition to the patrol work for the protection of the fur seals and sea otters, the units of the fleet have many other duties to perform, including the enforcement of law generally, rendering assistance to judicial authorities, assisting vessels in distress, rendering help to natives in destitute or needy circumstances, and other duties with which the Coast Guard vessels are usually charged. The peculiar conditions which obtain in western Alaska bring about unusual need for these vessels.

The *Unalga* left Seattle for Unalaska on April 20 and returned to Seattle on August 18. The *Manning* left the Puget Sound Navy Yard May 12 for Unalaska and returned to that navy yard on September 21. The *McCulloch* left Sausalito, Cal., for Unalaska May 24 and arrived at Port Townsend, Wash., on the return trip October 18.

Close attention throughout the season was given to the possible violation of the North Pacific Sealing Convention by vessels operating within the waters covered by that convention, but no evidences of pelagic sealing nor of sea-otter hunting were observed.

Numerous courtesies were rendered to the Bureau by the various Coast Guard vessels in Alaskan waters, particularly in the way of transportation of persons, mail, and certain supplies to and from and between the Pribilof Islands. The Bureau is under obligation to the Coast Guard for such assistance and for the friendly and earnest spirit of cooperation shown at all times by the officers and men of that service.

**SEALING PRIVILEGES ACCORDED ABORIGINES.**

By the provisions of the North Pacific Sealing Convention of July 7, 1911, Indians, Aleuts, or other aborigines dwelling on the Pacific coast of North America north of the thirtieth parallel of north latitude are permitted to carry on pelagic sealing in canoes not transported by or used in connection with other vessels, and propelled entirely by oars, paddles, or sails, and manned by not more than five persons each, in the way hitherto practiced and without the use of firearms;

and provided that such aborigines are not in the employment of other persons, or under contract to deliver the skins to any person. By the act of Congress, approved August 24, 1912, giving effect to the convention, the privileges accorded to these aborigines were restricted by a provision which prohibited for a period of five years the killing of fur seals by any person in the waters of Alaska within the 3-mile limit.

The law provides that no skins taken from seals belonging to the American fur-seal herd of the North Pacific Ocean may be brought into the United States unless they are officially marked and certified as having been legally taken. The Department of Commerce has arranged for the marking and certifying of skins lawfully taken by Indians or other aborigines, and any skins taken by these people should be promptly reported so that the proper steps may be taken to authenticate them.

No fur-seal skins have been reported as having been taken by natives of Alaska in the year 1916.

Indians of the State of Washington took about 470 fur-seal skins in 1916. Dr. C. L. Woods, superintendent and physician, United States Indian Service, Neah Bay, Wash., at the request of the Bureau, marked and authenticated 380 of these skins as having been lawfully taken. The authenticated skins were taken from seals speared from canoes west of La Push, Wash., and a compilation of the records made in respect to these skins shows that 313 were taken from female seals and 66 from males, the sex of one not having been indicated.

#### SHIPMENT OF SKINS FROM PRIBILOF ISLANDS IN 1916.

*Fur-seal skins.*—The 1916 shipment of fur-seal skins, consisting of 4,282 skins from St. Paul Island and 2,779 from St. George Island, a total of 7,061 skins, was made from the Pribilof Islands in October. The skins were transported from the islands to Seattle by the steamer *Elihu Thomson*. From Seattle they were shipped by freight via the Northern Pacific Railroad to Funsten Bros. & Co., St. Louis. All of these skins remained on hand at the end of the year, December 31, 1916.

*Fox skins.*—The fox skins taken on St. Paul and St. George Islands in the season of 1915-16 (420 blues and 20 whites) were shipped from the islands on the Coast Guard cutter *Unalga* in June. They were taken by the cutter to Seward, from which point they were shipped by Wells Fargo & Co. Express to Funsten Bros. & Co., St. Louis, Mo.

#### SALE OF FUR-SEAL SKINS.

On September 20, 1916, there were sold at St. Louis, Mo., by Funsten Bros. & Co., 1,900 fur-seal skins taken at the Pribilof Islands. The skins sold for \$74,530, an average of \$39.23 each.

These skins before being sold had been dressed, dyed, and machined by the Gibbins & Lohn Fur Skin Dressing & Dyeing Co., and were the first of the Government's skins so treated to be offered for sale.

The prices obtained for the skins were considered satisfactory, especially in view of the fact that for several years the number of fur-seal skins available for the trade has been limited. Unless the supply of these skins is sufficient to justify furriers in efforts to maintain the demand for them, maximum prices can not be obtained under ordinary conditions.

The following table shows details in regard to the sale of these skins:

DETAILS OF SALE OF 1,900 DRESSED, DYED, AND MACHINED PRIBILOF ISLANDS FUR-SEAL SKINS AT ST. LOUIS, SEPTEMBER 20, 1916.

Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.
500.....	70	{11 middlings and smalls.....	\$50	\$3,500
501.....	70	{59 smalls.....		
502.....	40	{11 middlings and smalls.....	51	3,570
503.....	80	{59 smalls.....		
504.....	80	{2 middlings.....	45	1,800
505.....	80	{5 middlings and smalls.....		
506.....	80	{33 smalls.....	36	2,880
507.....	80	{Large pups.....		
508.....	80	.....do.....	37	2,960
509.....	80	.....do.....	39	3,120
510.....	80	.....do.....	42	3,360
511.....	80	.....do.....	39	3,120
512.....	80	.....do.....	40	3,200
513.....	80	.....do.....	43	3,440
514.....	80	.....do.....	43	3,440
515.....	90	Middling pups.....	36	3,240
516.....	90	.....do.....	38	3,420
517.....	90	.....do.....	38	3,420
518.....	90	.....do.....	39	3,510
519.....	90	.....do.....	39	3,510
520.....	90	.....do.....	35	3,150
521.....	90	.....do.....	36	3,240
522.....	90	.....do.....	36	3,240
Total.....	1,900	.....	.....	74,530

The following table shows a summary of the trade classifications and the percentage of the total number in each class:

SUMMARY OF TRADE CLASSIFICATIONS AND PERCENTAGE IN EACH CLASS OF THE FUR-SEAL SKINS SOLD AT ST. LOUIS, SEPT. 20, 1916.

Trade classification.	Number in class.	Percentage.
Small pups.....	180	9.47
Middling pups.....	900	47.37
Large pups.....	640	33.68
Small seals.....	151	7.95
Middlings and smalls.....	27	1.42
Middlings.....	2	.11
Total.....	1,900	100.00

As stated in the corresponding report for 1915, there were 6,296 fur-seal skins from the Pribilof Islands on hand in the States on December 31, 1915. Nineteen hundred of these were sold September

20, 1916. The balance, 4,396, together with those shipped in 1916, 7,061, a total of 11,457, were on hand in the States December 31, 1916.

### SALE OF FOX SKINS.

The fox skins shipped from St. Paul and St. George Islands in 1916 were sold at St. Louis by Funsten Bros. & Co. on September 20, 1916. The 420 blue-fox skins brought \$20,242, or an average price of \$48.20 each; and the 20 white-fox pelts \$285, or an average price of \$14.25 each.

The following table shows details in regard to the sale of these skins:

DETAILS OF SALE OF 420 BLUE-FOX SKINS AND 20 WHITE-FOX SKINS FROM PRIBILOF ISLANDS AT ST. LOUIS, SEPTEMBER 20, 1916.

Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.
Blue-fox skins:				
1.....	4	Ex. ex.....	\$128.00	\$512
2.....	12	I.....	75.00	900
3.....	12	II.....	66.00	792
4.....	14	II low.....	39.00	546
5.....	18	III.....	26.00	468
6.....	18	IV.....	15.00	270
7.....	17	9 V.....	3.00	51
8.....	12	8 skins.....	75.00	900
9.....	12	I blue.....	54.00	648
10.....	14	II low blue.....	42.00	588
11.....	14	III blue.....	23.00	322
12.....	18	IV blue.....	14.50	261
13.....	12	I pale.....	51.00	612
14.....	18	II pale.....	42.00	756
15.....	7	I ex. pale.....	40.00	280
16.....	4	Ex. ex.....	113.00	452
17.....	10	I.....	78.00	780
18.....	12	II.....	61.00	732
19.....	14	II low.....	40.00	560
20.....	10	I blue.....	66.00	660
21.....	12	II blue.....	51.00	612
22.....	14	II low blue.....	39.00	546
23.....	16	IV blue.....	13.00	208
24.....	4	Ex. ex.....	135.00	540
25.....	10	I.....	80.00	800
26.....	12	II.....	61.00	732
27.....	12	II.....	58.00	696
28.....	14	II low.....	42.00	588
29.....	10	I blue.....	74.00	740
30.....	12	II blue.....	48.00	576
31.....	14	II low blue.....	37.00	518
32.....	4	Ex. ex.....	125.00	500
33.....	10	I.....	80.00	800
34.....	12	II.....	54.00	648
35.....	12	II.....	54.00	648
White-fox skins:				
536.....	20	6 I.....	14.25	285
		5 II.....		
		9 II stained.....		
Total.....				20,527

### SEIZURE OF FUR-SEAL SKINS.

In September, 1916, six fur-seal skins which had not been marked and authenticated as having been lawfully taken were seized at Juneau. Pursuant to an opinion by the solicitor for the Department they were delivered to the United States marshal at Juneau with the view of obtaining a decree of forfeiture from the courts.

## MINOR FUR-BEARING ANIMALS.

### FIELD WORK.

All the wardens in active service were detailed to field work in Alaska throughout the year. While it was expedient and desirable to utilize the services of some for brief periods in connection with patrol and other fisheries work and to detail one late in the year to the Pribilof Islands, the greater part of their time was devoted to work in connection with the minor fur-bearing animals.

The wardens concerned in enforcing the law and regulations for the protection of the fur-bearing animals of Alaska are shown in the list of employees in the introduction.

One warden, C. F. Townsend, was detailed throughout the year in the interior of Alaska, with headquarters at Fairbanks. To indicate to some degree the extent of territory under the supervision of wardens in the interior of Alaska the following trips are cited: Between January 29 and February 15 a trip was made with dog team from Fairbanks to Kaltag, following the valleys of the Tanana and Yukon Rivers, a distance of approximately 600 miles one way. Fairbanks was reached on the return trip March 12. In the latter part of the month a trip was made to the Wood River region. In the first part of April a trip was made from Fairbanks to Circle and return. It had been planned to extend this trip to Fort Yukon, but information received at Circle to the effect that the trails were breaking up and were dangerous made a curtailment seem advisable. In the summer season a trip was made from Fairbanks to St. Michael, thence to Fort Yukon, and from there to Fairbanks. This trip was made on launches and steamers and stops were made en route at trading posts and Indian villages whenever possible. The total distance traveled on this trip was approximately 3,000 miles.

Wardens Brown and Baker were stationed in the Bristol Bay region during the winter of 1915-16, with headquarters on the Nushagak River. Four months, from January 11 to May 11, 1916, were spent in travel, in the course of which it is estimated that one warden covered 1,400 miles and the other 1,170. Reindeer and dogs were used for transportation. The itinerary included Koggiung, on the Kvichak River, Naknek, Ugaguk, Ugashik, a trip up Kvichak River and Iliamna Lake to the Indian village of Iliamna at the head of that lake, including visits at Kaskanak and Noghelung and Becharof Lake. Fur was inspected, natives were given instructions in regard to regu-

lations, and attention was given to complaints of illegal trapping and poisoning of fur-bearing animals.

Warden Larson was employed throughout the year in the eastern part of Alaska, with headquarters at Chicken. Until the latter part of the year this warden was employed in a temporary capacity and only a moderate allotment was made for field work. The territory which may be covered, however, from this point as a center by a capable warden who is experienced in field work in Alaska is considerable, and it is hoped that it will be possible to give more attention to the fur-bearing animals in this part of Alaska in the future.

#### REGULATIONS.

The only change made in the year in the departmental regulations for the protection of the minor fur-bearing animals in Alaska was that which gives complete protection to martens from March 15, 1916, to November 15, 1921. The affording of this protection to the martens appears to have met with entire approval. Comment has been made, however, that the prohibition upon the taking of martens will cause trouble for the alleged reason that traps set for minks and ermines will capture martens. The Bureau has been disposed to believe that trappers need not experience much difficulty in this matter. As a general proposition, minks are trapped mostly along watercourses, while martens are taken on higher grounds, and ermines are taken in the course of trapping for other animals and are not made an object of special pursuit. In any event the Bureau is firmly of the opinion that martens in Alaska must receive for a period of years greater protection than has been accorded them in recent years. It may be that experience will show that some further steps are desirable in order to secure in the best way this protection.

It developed that some persons were retaining legally-taken marten pelts in their possession in Alaska, and in order that they might not be embarrassed in case they wished to ship these from Alaska the Bureau, acting upon the suggestion of a warden, arranged for the recording of all pelts which the owners proposed to retain in Alaska after November 15, 1916. All shipments of marten pelts made after November 15, 1916, will be checked against these records. Through March 31, 1917, 58 reports were received, recording 3,031 pelts.

#### SHIPMENTS OF LIVE FUR-BEARING ANIMALS FROM ALASKA.

Aside from 17 blue foxes shipped from the Pribilof Islands by the Bureau, the only live fur-bearing animals shipped from Alaska in the calendar year 1916 were 12 cross and 2 silver foxes consigned by J. R. Gibson, Copper Center, to the Alaska Fur and Silver Fox Co., North Bend, Wash.



**SEIZURES AND PROSECUTIONS.**

Acting on cumulative evidence at hand, Wardens Baker and Brown on March 21, 1916, had a warrant sworn out for the arrest of Christ Hansen, against whom complaints had been made charging him with the use of poison for the taking of foxes in the Iliamna Lake region. Hansen was arrested four days later 110 miles from Iliamna and brought to that place. On arraignment the defendant pleaded not guilty and asked for a trial by jury. The jury and witnesses were secured and the case was tried April 1.

From the records of the Bureau it appears that the defendant had been trapping in the vicinity of Big Tulare Creek, a tributary of Iliamna Lake, in the season of 1915-16; that on December 5, 1915, he scattered along a trail leading up Big Tulare Creek two certain pieces of meat which had evidently been spread with poison; that these two pieces of meat were recovered by a witness, who testified in court, and were taken by him and fed to a worthless dog at the Government reindeer station on Big Tulare Creek; that the dog was immediately seized with convulsions and died within 20 minutes after swallowing the meat; that a dead fox and the body of a dead raven which had fed off the stomach and part of the side of the fox were found in the trap-run trail of the defendant running down the shore of the lake from the mouth of Big Tulare Creek; that the condition of the snow pointed to the fox having eaten something along the trail, and the state of the snow showed that it had died in convulsions; that the body of the raven, found a few feet away from the fox, and which had died after eating either of the fox or what the fox had eaten of, as well as the body of the fox were recovered and taken to the Government reindeer station at Big Tulare Creek. Witnesses testified to seeing the defendant on these trap-run trails, to seeing him standing in a suspicious attitude on the trail of one of his lines, and going there after he had left and finding meat that subsequently proved to be poisoned as aforesaid. The defense made no denials, and when the case went to the jury it returned in a few minutes a verdict of not guilty.

The two wardens took up the case at the instance of United States Commissioner L. H. French, who was also an assistant superintendent of education for this region. The case first came to his attention and he informed them that it was the strongest and one of the best upon which to secure a conviction that had come under his observation in the many years he had been in the Bristol Bay region. While there was a failure to secure a conviction, it is thought that the prosecution of the case has had a good moral effect.

In April, 1916, the pelts of four cross foxes were seized at Tanana Crossing, a small trading post in the eastern part of Alaska. The

foxes from which the pelts were taken had been captured in the open season and subsequently killed.

On March 14, 1916, the matter of an alleged poisoning of foxes was brought to Warden Hemenway's attention at Tanana. An Indian had brought from the Tozi flats two foxes which he claimed were poisoned, and he also had a quantity of baits which he had picked up on the Tozi flats. Examination of the foxes and the baits disclosed strychnine in both. The stomachs of the foxes also contained some of the same kind of food as that of which the baits were made. There were no trap marks on the legs of the foxes. A trip was then made to the Tozi flats by Mr. Hemenway. On the way the remains of two dead foxes were found. Near a camp where two persons, H. Ross and A. Crane, had trapped, the carcass of a fox was found. The remains of the three foxes found on the trip were taken to Tanana. Poison was found in the carcass which had been obtained at the camp of Ross and Crane. Ross was arrested at Tanana and being brought into court pleaded not guilty and requested a jury trial. The case was tried on April 11 and the jury acquitted the defendant. The charge against Crane was dismissed by the court.

Fifty-seven beaver skins found among the effects of one Thomas Phillips, who was murdered on the Kuskokwim River in May, 1916, came into the possession of Dr. W. F. Green, United States commissioner, Tokotna. The killing of beavers in Alaska at any time being unlawful, instructions were issued to have the skins forwarded to agents of the Department for sale for the account of the Government.

### FOX FARMING.

#### KODIAK-AFOGNAK REGION.

Many of the fox-farming operations which were undertaken in this region a few years ago were the result of the demand which came from the eastern part of Canada for live animals for use for breeding purposes. With the subsidence of this demand operators who had not made the production of fur the principal object of their work have lost interest to a certain extent and have either abandoned their efforts or have continued to carry them on in a more or less desultory fashion. There are, however, some fox farmers in this region whose operations were not dependent upon the demand for live foxes and these are continuing their work. In general the ones who have secured the best immediate returns are those who have had stock running wild and have trapped from it within the bounds of its natural increase. The following information in regard to fox farming in this region has been furnished the Bureau:

In 1916 operations were continued by the Kodiak Fox Farm on Long Island, Carlson & Smith at Uyak Bay, Peter J. Petrovsky on Amok Island, Alex Friedolin on Hog Island, Frank Lowell on

Ugaiushak Island, John Tashwak on an island in Marmot Bay, I. P. Chichenoff on an island near Kodiak, August Olson on Ugak Island, and Albert Johnson on Harvester Island.

Since Charles W. Pajoman became joint owner with Charles Peterson of the fox farm on Bare Island (locally known as Dry Island and so designated in the report on the Alaska Fisheries and Fur Industries for 1915), situated in Kupreanof Straits and about  $1\frac{1}{2}$  miles from the nearest point of Kodiak Island, a corral about 60 feet square of galvanized wire has been built. The side walls were made about 7 feet high and the top was completely covered with galvanized-wire netting.

Ingvald Loe, after having been engaged for a number of years in unsuccessful attempts to rear blue foxes in corrals on Raspberry Island, sold his stock in 1915. After having formed a partnership with Charles W. Pajoman a stock consisting of three pairs of silver foxes and two pairs of cross foxes were placed in corrals on the island. Three pairs produced young in 1916, two litters of three pups each and one of four.

M. D. Snodgrass and associates, in addition to using Kalsin Island, about 12 miles from Kodiak, have occupied Queer Island, about one-fourth mile from Kalsin Island. A few cross foxes had previously been released on this island and in 1916 nine adult silver foxes were placed there. It is not known that any young foxes were born on either Kalsin or Queer Islands in 1916. Mr. Snodgrass and his associates have also taken up Nelsons Island, near Uzinki, but down to the fall of 1916 had not placed any foxes on it.

Frank Peterson continued his fox-farming operations on an island near the mouth of Ayakulik River. The foxes run at large. In the report on the Alaska fisheries and fur industries for 1915 it was stated that the island was near the mouth of Red River. Locally the names of these two rivers are confused. Red River proper is about 7 miles north of Ayakulik River. In September, 1916, Mr. Peterson reported a litter of five young silver grays.

Otto Kraft & Co. purchased several foxes in 1916 and placed them on two small islands, Svitolak and Middle, in Kalsin Bay, about 15 miles from Kodiak. Nine silver-gray foxes were liberated on Svitolak Island. Middle Island, which is separated from Svitolak by a channel of about 500 yards in width, was stocked with 16 cross and 2 red foxes. A cabin for the use of a caretaker was built on Svitolak and arrangements were made for providing food for the foxes.

Alexander Lukin placed four silver foxes on one of the Noisy Islands, Uganik Bay, in the winter of 1914-15. The following winter one cross and one silver fox were added to the stock. The foxes were all adult animals when captured and were taken in the course of ordinary trapping in the open season.

## TANANA AND YUKON RIVERS.

It appears that many of those who were engaged in fox farming along these rivers in 1915 continued their work in 1916. While in cases some degree of success was had and some improvements were made to equipment, the results as a whole have not been encouraging.

In December, 1916, George L. Morrison, Hot Springs, had 27 pairs of foxes in his pens, most of which were silver grays. In the year 13 litters of young were raised and with but slight loss. At the Tolovana Fox Farming Co. (Vachon farm), Tolovana, 40 foxes were on hand in December after the stock had been reduced by the killing of 36 foxes.

## MISCELLANEOUS FOX FARMING.

Oscar Olsen, of Unga, has begun operations on Big Koniui Island, one of the Shumagin group. In the latter part of 1916 he reported having placed on the island 13 pairs of red foxes and that he expected to continue to place foxes there until he had about 30 pairs.

Harry Olsen, of Sand Point, reported that he expected to place several pairs of blue foxes on Andronica Island for propagation purposes.

Andrew Grosvold, of Sand Point, Popof Island, in addition to his fox-farming operations on numerous other islands of the Shumagin and Sannak groups, has built corrals on Popof Island. The land selected is well drained and is broken by ledges of loose rock in which the foxes make their own burrows. The inclosures are large compared with most corrals, each covering a half acre or more. The expense connected with this method of impenning foxes is slight.

L. G. Michael, of Franklin, reported in August, 1916, that he had a stock of 1 silver, 5 cross, and 8 red foxes. One fox raised in 1915 had given birth to 6 young ones.

W. H. Newton, of Healy River (Richardson post office), has been interested in fox farming for some time.

Joseph Voelkl, Eighteen Mile Post, Haines, reported a stock of 12 foxes, 4 of which were young.

James York, of Sumdum, has operated a blue-fox farm on Sumdum Island, southeastern Alaska, for several years. The foxes live practically in a wild state and their number can not be definitely ascertained.

Information in regard to islands leased by the Department of Commerce for fur-farming purposes is furnished elsewhere in this report.

**FUR-FARMING POSSIBILITIES IN SOUTHEASTERN ALASKA.**

From a report submitted by Inspector Walker the following information in regard to certain observations on the possibilities in fur farming in southeastern Alaska is extracted:

Due perhaps to the smaller prices received for furs, especially for fox pelts in the past two or three years, active interest in fur farming in this region has suffered a decline, but this certainly is only a temporary lessening of interest, and it is believed that in time this line of activity will be one of the important industries of the district.

There is no satisfactory information at hand as to all the fur farms operating in the region; indeed, most of them can scarcely be termed fur farms as yet, there being in some cases but one or two animals in restricted and improper quarters. In the Chilkat Valley some attention has been given to fox farming, the attempts being made by taking the young from the dens in the spring. There have resulted several small undertakings of this sort, some of which seem to be promising. A few other animals, minks and perhaps some martens, are also kept in the valley. It is felt that the Chilkat Valley will some day become the "Prince Edward Island" of the North Pacific, as it possesses unusual natural advantages for fur farming, especially fox raising. Some of these advantages are: A climate approaching that of an interior country in that it is clear and cold in winter and warm and dry in summer; the rainfall is the smallest of any portion of southeastern Alaska; there is an easily accessible food supply as the fish are, or should be, abundant in the Chilkat River, which flows through the valley; there is perfect drainage by reason of the sandy soil; large and permanent pens may easily be constructed because the sandy soil is underlaid at an average depth of about 3 feet by a hard subsoil of clay, through which foxes could scarcely dig out under the fences; the valley is easy of access in both summer and winter; it is the natural home of the fox and in a region in which melanism is prevalent, thus producing a considerable percentage of dark individuals even from red parents.

In addition to the fox farms in the Chilkat Valley it is understood that an attempt is being made to introduce red stock on Sokoi Island, near Petersburg. This island was formerly held for use as a blue-fox ranch. In this connection it is believed that the red-fox species will not prove profitable on the islands of this region as they are not native to such climatic conditions as prevail in the way of excessive rainfall and wet underbrush and moss. Also it is believed that the effect of the salt-water atmosphere, which coarsens the fur and makes it less brilliant, will be experienced, thus reducing the value of the skins even though the animals should thrive, which is greatly doubted. A blue-fox ranch on Sumdum Island is conducted by James York with apparent success. The number of foxes on this island can scarcely be guessed at as they live in practically a wild state. This is the only island fox ranch in the district as yet upon a stable footing.

The food supply available on the islands suitable for fur farming in southeastern Alaska is almost unlimited, and the breeding of otters, minks, and martens will certainly be undertaken in the future by numerous parties. The business if properly handled will undoubtedly prove to be profitable.

It is believed that whenever a fur farm has reached an established status it should be as free from restrictions and regulations as the cattle and stock ranches in the same region would be in respect both to the killing and to the exportation of the animals, for they are certainly as much domestic stock as are the cattle and horses raised by man.

At present the difficulty of obtaining title to land within the national forest deters many from attempting elaborate undertakings. There should be some provision by which persons could secure an entire small island for fur farming so that they would not be compelled to fence to retain the animals on their own grounds.

### MARTEN AND MINK FARMING.

Some attention is being given in Alaska to the problem of domesticating martens and minks. John Fanning, of McHenry Anchorage, Etolin Island (Wrangell post office), has concerned himself with both species. For a while they were kept in pens on his farm, but the martens, five males and nine females, were later turned loose on a small island of about 4 acres in area. The island is rough and timbered and affords excellent hiding places and ample freedom, and at the same time the animals are as secure as if kept in close confinement. In October he reported that he felt safe in stating that he had secured an average of three young martens for each of the females. At that time the young ones were almost as large as the old ones. Joseph Voelkl, Eighteen Mile Post, Haines, is interested in minks in connection with his fox-farming work.

### BOUNTY ON WOLVES.

At the second session of the Alaska Legislature an act was passed, approved March 31, 1915, placing a bounty of \$10 on each wolf killed in Alaska. Before the bounty may be paid on any animal it is required that certain portions, including the pelt properly prepared for sale, shall be forwarded to the Territorial treasurer, together with an affidavit in prescribed form, by the person who took the animal. The affidavit includes a statement to the effect that no poisons or other means that might cause the wanton destruction of any fur-bearing animals were used in taking the wolf for which the bounty is claimed. The treasurer is required to hold from time to time sales of the pelts which come into his keeping and to apply the proceeds of the sales first to the expense of caring for and disposing of such pelts and next to the payment of the bounties. He is further instructed to cause to be destroyed any skins which may prove to be worthless and unsalable. Penalties are provided for the making of any false affidavit for the purpose of fraudulently obtaining money under the provisions of the act. The biennial report of the Territorial treasurer for the two years ending December 31, 1916, showed that \$1,250 had been paid in bounties on 125 wolves.

### SHIPMENT OF FURS FROM ALASKA.

The Department requires that each shipment of furs from Alaska shall be reported to the Bureau of Fisheries. The reports are chiefly of value from a statistical standpoint, though at the same time they furnish useful information for other purposes. Two forms are distributed by the Bureau for the use of shippers in making their reports. One form is for use in reporting shipments made by mail; the other for shipments made otherwise than by mail—i. e., by express, freight, personal baggage, etc.

The following table shows the detailed statistics as compiled from information furnished the Bureau in regard to the furs shipped from Alaska in the years ending November 15, 1914, November 15, 1915, and November 15, 1916, respectively. The collector of customs at Juneau has rendered valuable assistance in the matter of checking statistics of his office with those of the Bureau.

FURS SHIPPED FROM ALASKA IN 1914, 1915, AND 1916.<sup>a</sup>

Species.	Year ended Nov. 15, 1914.			Year ended Nov. 15, 1915.			Year ended Nov. 15, 1916.		
	Number of pelts.	Average value.	Total value.	Number of pelts.	Average value.	Total value.	Number of pelts.	Average value.	Total value.
Bear:									
Black.....	663	\$12.57	\$8,333.91	739	\$7.50	\$5,542.50	1,129	\$9.00	\$10,161.00
Brown.....	32	9.00	288.00	20	7.50	150.00	41	7.50	307.50
Glacier.....	3	22.50	67.50	3	50.00	150.00	5	50.00	250.00
Grizzly.....				20	20.00	400.00	14	14.00	196.00
Polar.....	104	40.00	4,160.00						
Beaver.....	10	10.00	100.00	970	10.00	700.00	c37	6.50	240.50
Ermine.....	6,873	.96	6,598.08	3,538	.60	2,122.80	4,345	.80	3,476.00
Fox:									
Black.....	13	253.00	3,289.00	8	400.00	3,200.00	26	250.00	6,500.00
Blue.....	239	46.59	11,135.01	382	50.00	19,100.00	659	50.00	32,950.00
Blue, Pribilof Islands.....	256	112.49	28,797.88	253	112.49	28,459.97	420	48.20	20,242.00
Cross.....	1,380	14.24	19,651.20	1,360	12.00	16,320.00	2,508	25.00	62,700.00
Red.....	14,967	9.80	146,676.60	11,770	8.00	94,160.00	15,711	12.00	188,532.00
Silver gray.....	153	147.30	22,536.90	187	150.00	28,050.00	318	150.00	47,700.00
White.....	6,530	12.93	84,432.90	5,967	13.00	77,571.00	6,178	20.00	123,560.00
White, Pribilof Islands.....	25	23.94	598.50	40	23.94	957.60	20	14.25	285.00
Hare, Arctic.....	1,263	.40	505.20	51	.10	5.10	1,090	.15	163.50
Lynx.....	6,930	12.35	85,585.50	9,374	8.00	74,922.00	21,608	12.00	259,296.00
Marten.....	6,497	7.56	49,117.32	3,028	6.00	18,168.00	3,100	9.00	27,900.00
Mink.....	35,623	4.46	158,878.58	23,073	2.60	46,146.00	22,255	4.00	89,020.00
Muskkrat.....	101,202	.33	33,396.66	32,933	.15	4,939.95	101,827	.35	35,639.45
Otter:									
Land.....	1,008	10.70	10,785.60	980	8.00	7,840.00	1,330	15.00	19,950.00
Sea.....	d 1	200.00	200.00				d 1	500.00	500.00
Seal, fur, Pribilof Islands.....	2,896	30.00	86,880.00	3,000	30.00	90,000.00	7,061	30.00	211,830.00
Squirrel.....	662	.08	52.96	167	.05	8.35	214	.10	21.40
Wolf.....	44	7.00	308.00	51	4.00	204.00	57	7.00	399.00
Wolverine.....	136	11.44	1,555.84	119	7.00	833.00	297	6.00	1,782.00
Total.....			763,931.14			519,950.27			1,143,601.35

<sup>a</sup> The corresponding tables in the reports for 1914 and 1915, Bureau of Fisheries Documents Nos. 819 and 834, did not include shipments of blue-fox, white-fox, or fur-seal skins from the Pribilof Islands.

<sup>b</sup> Confiscated pelts.

<sup>c</sup> Thirty-three shipped under permit.

<sup>d</sup> Found dead.

## LEASING OF ISLANDS FOR FUR FARMING.

The Department of Commerce is authorized to lease for fur-farming purposes certain islands off the coast of Alaska, and a few leases have been executed from time to time.

In 1916 the lease of Carlson (Crafton) Island to the Moose Bay Fur and Trading Co. was canceled. Marmot Island, located near Afognak Island, was leased to O. L. Grimes, of Afognak, for a period of five years commencing September 1, 1916, at an annual rental of \$200 per year.

Marmot Island is located just outside the Afognak Reservation. It is approximately 6 miles long and 1½ miles wide and is rather

inaccessible, there being no harbors. The Semidi Propagating Co. at one time occupied it for fox farming. Mr. Grimes expected to stock the island with foxes and had also considered the advisability of introducing minks.

The islands under lease on December 31, 1916, were as follows:

Island.	Annual rental.	Lessee.
Middleton .....	\$200	Joseph Ibach, Valdez, Alaska.
Simeonof .....	250	J. C. Smith, Sand Point, Alaska.
Little Koniuji .....	205	Andrew Grosvold, Sand Point, Alaska.
Marmot .....	200	O. L. Grimes, Kodiak, Alaska.

#### PROPOSED LEGISLATION.

On January 29, 1916, Hon. J. W. Alexander introduced a bill (H. R. 10393, 64th Cong., 1st sess.) to redistribute jurisdiction of the Secretary of Commerce and the Secretary of Agriculture over the protection of fur-bearing animals in Alaska, and for other purposes. The bill included provisions for transferring to the Secretary of Agriculture the powers and duties now conferred upon the Secretary of Commerce in respect to protecting fur-bearing animals in Alaska, fur seals and sea otters excepted, and in respect to leasing certain islands in Alaska for use for fur-farming purposes. The bill also provided for transferring to the Secretary of Commerce the jurisdiction now exercised by the Secretary of Agriculture and the Governor of Alaska in respect to walruses and sea lions. It was expressly stipulated that nothing in the proposed act should affect existing laws vesting in the Secretary of Commerce jurisdiction over the Pribilof Islands and the fur-bearing animals thereon. -







SALMON ON THE SPAWNING BEDS.

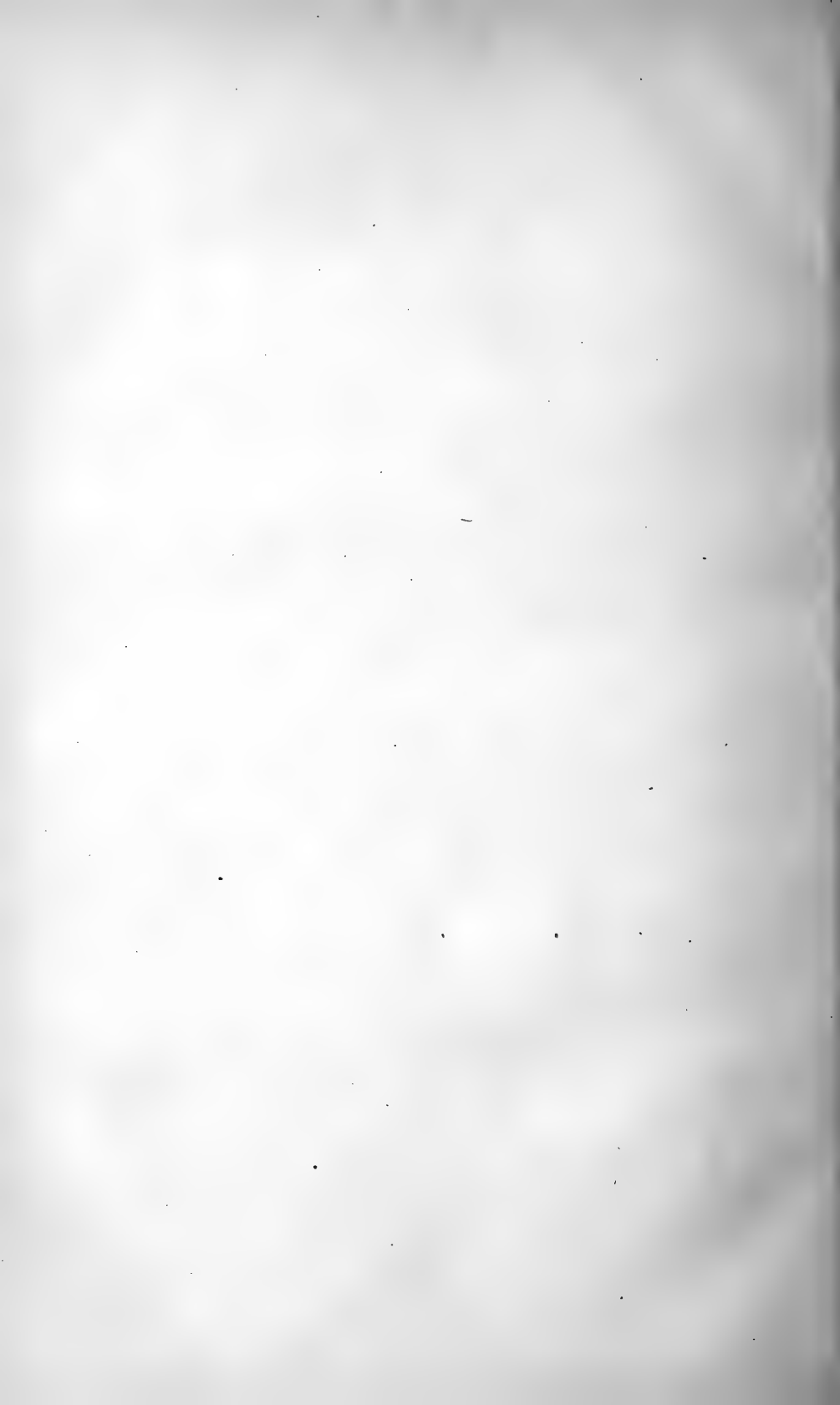
# PACIFIC SALMON FISHERIES

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By JOHN N. COBB

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Appendix III to the Report of the U. S. Commissioner  
of Fisheries for 1916



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# PACIFIC SALMON FISHERIES.

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By JOHN N. COBB.

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## INTRODUCTION.

The most valuable commercial fisheries in the world, excepting only the oyster and herring fisheries, are those supported by the salmon. Of these the most important by far are the salmon fisheries of the Pacific coast of North America, where California, Oregon, Washington, and Alaska, including also British Columbia, possess industries representing millions of dollars of investment and millions of output annually. In Siberia the fishery is increasing in importance annually as means of transportation become better, while Japan is also becoming a large factor in the salmon markets of the world through her investments in the salmon fisheries of Siberia and, to a lesser extent, through fisheries prosecuted in her own waters.

In this revised report<sup>a</sup> considerable new material has been added, while some of the chapters have been entirely remodeled and materially enlarged. The statistical data have been brought up to January 1, 1916.

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<sup>a</sup> The salmon fisheries of the Pacific coast. By John N. Cobb. Bureau of Fisheries document no. 751, 180 p. 1911.

## I. THE SPECIES OF SALMON AND THE RUNS.

The Pacific coast salmones are all included in the genus *Oncorhynchus*. With them the fishermen incorrectly class the steelhead trout, which really belongs to the closely related genus *Salmo*.

As long ago as 1731 the species of *Oncorhynchus* were first made known by Steller, who, almost simultaneously with Krascheninikov, another early investigator, distinguished them with perfect accuracy under their Russian vernacular names. In 1792 Walbaum adopted these vernacular names in a scientific nomenclature for these fishes.

Five species of salmon (*Oncorhynchus*) are found in the waters of the north Pacific, ranging northward from Monterey Bay on the American coast and Japan on the Asiatic, the extreme northern distribution of certain of the species having not yet been accurately determined. The five species are: (1) *Oncorhynchus tshawytscha*, quinnat, tyee, chinook, spring, or king salmon; (2) *Oncorhynchus nerka*, blueback, red, sukkegh, or sockeye salmon; (3) *Oncorhynchus kisutch*, silver, coho, or white salmon; (4) *Oncorhynchus keta*, dog, keta, or chum salmon; and (5) *Oncorhynchus gorbuscha*, humpback or pink salmon.

### CHINOOK, QUINNAT, OR KING SALMON.

The largest, best known, and most valuable of these is the chinook or king salmon (*O. tshawytscha*). It is found throughout the region from the Ventura River, Cal., to Norton Sound, Alaska, and on the Asiatic coast as far south as northern China. As knowledge extends, it will probably be recorded in the Arctic.

In the spring the body is silvery, the back, dorsal fin, and caudal fin having more or less of round black spots, and the sides of the head having a peculiar tin-colored metallic luster. In the fall the color is, in some places, black or dirty red. The fish has an average weight of about 22 pounds, but individuals weighing 70 to over 100 pounds are occasionally taken. One was caught near Klawak, Alaska, in 1909 which weighed 101 pounds without the head. The Yukon River is supposed to produce the finest examples, although this supposition is not based on very reliable observations. The southeast Alaska fish average as high as 23 pounds in certain seasons, followed by an average of about 22 pounds in the Columbia River and about 16 pounds in the Sacramento.

In most places the flesh is of a deep salmon red, but in certain places, notably southeast Alaska, Puget Sound, and British Columbia,

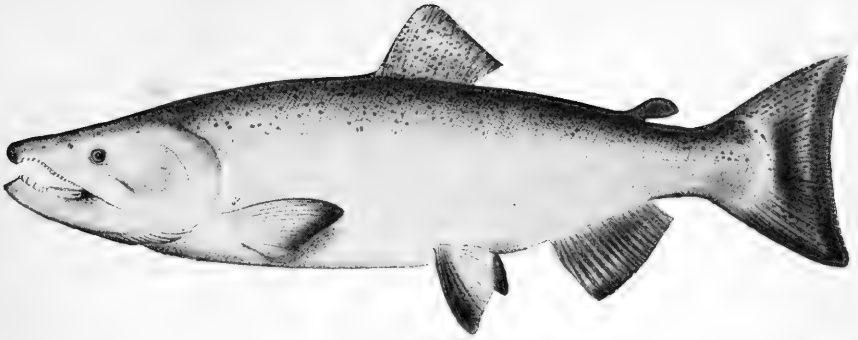


FIG. 1.—CHINOOK SALMON. BREEDING MALE.

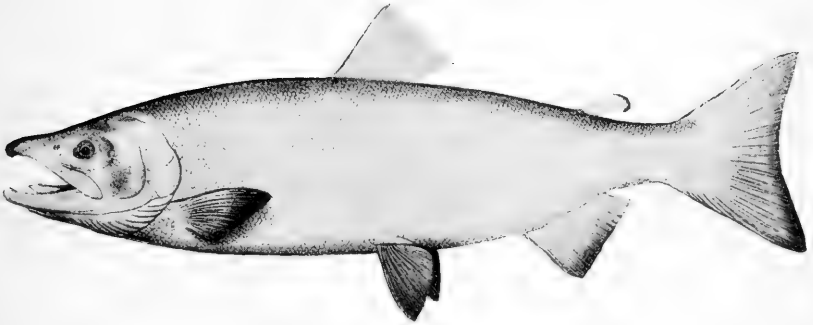


FIG. 2.—SOCKEYE SALMON. ADULT MALE.

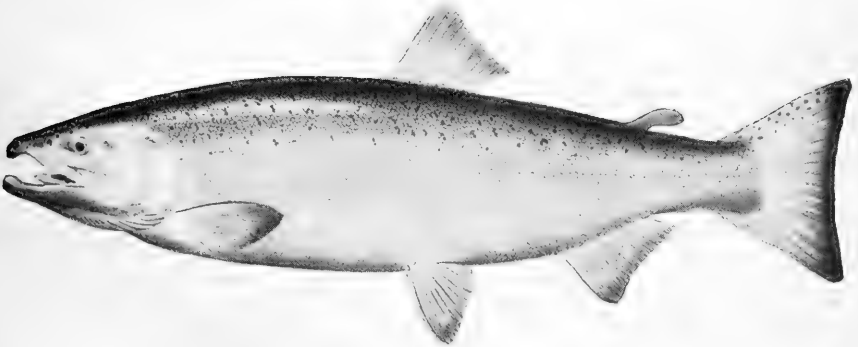


FIG. 3.—SILVER SALMON. BREEDING MALE.

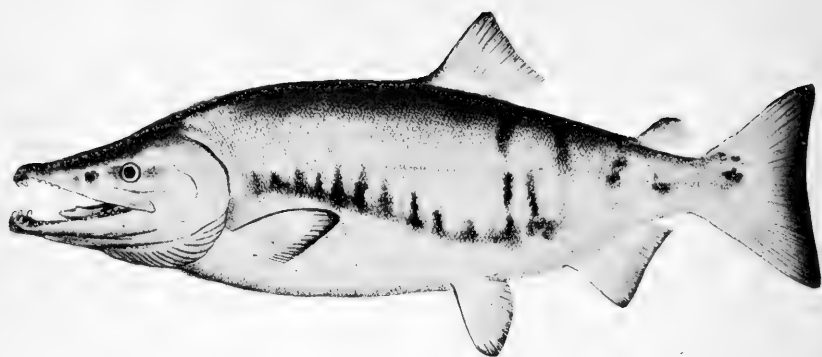


FIG. 1.—CHUM SALMON. BREEDING MALE.



FIG. 2.—HUMPBACK SALMON. ADULT MALE.



FIG. 3.—STEELHEAD TROUT

many of the fish, the proportion being sometimes as much as one-third of the catch, have white flesh. A few examples have been taken with one side of the body red and the other white, while some are found with mottled flesh. No reasonable explanation of this phenomenon has yet been given.

In its southern range the quinnat strikes in at Monterey Bay in sufficient numbers to justify commercial fishing about the middle of April, where it is seen feeding upon the inshore moving schools of herring and sardines, continuing until in August. There are two runs of spawning fish in the Sacramento, the first or "spring run" beginning in April and continuing throughout May and June, these fish spawning mainly in the cold tributaries of the Sacramento, such as the McCloud and Fall Rivers. The second or "fall run" occurs in August, September, and October, and these fish spawn in the riffles in the main river between Tehama and Redding, also entering the tributaries in that vicinity. The two runs merge into each other. It is also claimed that there is a third run which comes in December.

In former years the San Joaquin and the American and Feather Rivers of the Sacramento system had large runs of salmon, but excessive fishing and the operation of various mining and irrigation projects have practically depleted them.

The Eel and Mad Rivers of northern California have only a late or fall run, while the Klamath River has both a spring and a fall run, and Smith River has a spring run alone. Rogue River in Oregon has both a spring and a fall run, and the Umpqua and several other coast streams of Oregon have small early runs.

The Columbia River has three runs, the first entering during January, February, and March, and spawning mainly in the Clackamas and neighboring streams. The second, which is the best run, enters during May, June, and part of July, spawning mainly in the headwaters. The third run occurs during late July, August, September, and part of October, and spawns in the tributaries of the lower Columbia.

In Puget Sound chinook salmon are found throughout the year, although it is only during the spawning season that they are very abundant. In the Fraser River, a tributary of the Sound, the run occurs from March to August.

In the Skeena River, British Columbia, the run occurs from May to July, the same being approximately true of the Nass also.

In Southeast Alaska they are found all months of the year. From March to the middle of June they are abundant and feeding in the numerous straits and sounds; in May and June the spawning fish enter the Unuk, Stikine, Taku, Chilkat, Alsek, and Copper Rivers in large numbers, and in a few smaller streams in lesser abundance. In August, September, and October they are again to be found in

large numbers feeding in the bays and sounds, while during the winter months a few have been taken on trawls set for halibut, showing that they are living in the lower depths at this time.

In Cook Inlet the run occurs during May and June and is composed wholly of red-meated fish; in the rivers of Bristol Bay the run comes in May and June, and the same is true of the Togiak, Kusko-kwim, and Yukon Rivers, although fish may be seen in the upper courses of the Yukon in July, the lateness here being due to the immense distance the fish have to cover.

### SOCKEYE, BLUEBACK, OR RED SALMON.

The sockeye or blueback salmon (*O. nerka*), which forms the greatest part of the canned salmon of the world, when it first comes in from the sea is a clear bright blue above in color, silvery below. Soon after entering the river for the purpose of spawning the color of the head changes to a rich olive, the back and sides to crimson and finally to a dark blood red, and the belly to a dirty white. The maximum weight is about 12 pounds, and length 3 feet, with the average weight about 5 pounds, varying greatly, however, in different localities. Observations of Chamberlain<sup>a</sup> in Alaska show that the average weight of a number of sockeyes taken from Yes Bay was 8.294 pounds, while the average weight of a number from Tangas was only 3.934 pounds. Evermann and Goldsborough<sup>b</sup> report as a result of the weighings of 1,390 red salmon, taken from as many different places in Alaska as possible, an average weight for the males of 7.43 pounds; for the females, 5.78 pounds; or an average weight for both sexes of 6.57 pounds. A run of small, or dwarf, males accompanies certain of the main runs, these being especially noticeable in the Chignik Lagoon, Alaska, run. This species usually enters streams with accessible lakes in their courses.

These fish are occasionally found landlocked in certain lakes, especially in the State of Washington, and are always much smaller in size than the sea-run fish. In Bumping Lake, near North Yakima, Wash., they are quite abundant and are mature when about a pound in weight. Despite the fact that these fish have a soft mouth, anglers consider them very gamey. They take bait, the fly, and the trolling spoon.

A few specimens of the sockeye have been taken as far south as the Sacramento River. In Humboldt County, Cal., small runs are said to occur in Mad and Eel Rivers. Only an occasional specimen appears in the coastal streams of Oregon. The Columbia is the most

<sup>a</sup> Some observations on salmon and trout in Alaska. By F. M. Chamberlain, naturalist, U. S. Fisheries steamer *Albatross*. U. S. Bureau of Fisheries Document no. 627, p. 80.

<sup>b</sup> The fishes of Alaska. By B. W. Evermann and E. L. Goldsborough. Bulletin Bureau of Fisheries, vol. XXVI, p. 257.

southern river in which this species is known to run in any considerable numbers, entering the river with the spring run of chinooks. From here south the species is called blueback exclusively. A considerable run enters the Quinault River, Wash., and there is also a small run in Ozette Lake, just south of Cape Flattery.

In the Puget Sound region, where it is known as the sockeye, this species ascends only the Skagit River in commercial numbers, although a small run appears in the Lake Washington system of lakes and, possibly, in the Snohomish, Stillaguamish, and Nooksack Rivers.

The greatest of all the sockeye streams is the Fraser River, British Columbia, and this stream has been famous from very early days for its enormous runs of this species, a peculiar feature of which is that there is a marked quadrennial periodicity in the run. The maximum run occurs the year following leap year, the minimum on the year following that. The greater part of the catch of the Puget Sound fishermen is made from this run as it is passing through Washington waters on its way to the Fraser. The fish strike in during July and August on the southwest coast of Vancouver Island, apparently coming from the open sea to the northwest. They pass the Straits of Juan de Fuca, Rosario, and Georgia, spending considerable time in the passage and about the mouth of the river. Small numbers run as early as May and as late as October, but the main body enters about the first week in August.

The sockeye occurs in most of the coastal streams of British Columbia, and is usually the most abundant species. The principal streams frequented are the Skeena, Rivers Inlet, Nass, Lowe Inlet, Dean Channel, Namu Harbor, Bella Coola, Smith Inlet, Alert Bay, and Alberni Canal.

In Alaska, where this fish is generally known as the red salmon, it is abundant and runs in great numbers in all suitable streams, of which, in southeast Alaska, the following are the most important: Boca de Quadra, Naha, Yes Bay, Thorne Bay, Karta Bay, Nowiskay, Peter Johnson, Hessa, Hetta, Hunter Bay, Klawak, Redfish Bay, Stikine, Taku, Chilkoot, Chilkat, Alsek, Situk, Ankow, etc.; in central Alaska, Copper, Knik, Kenai, Susitna, Afognak, Karluk, Alitak, Chignik; in the Bristol Bay region, the Ugashik, Ugaguk, Naknek, Kvichak, Nushagak, and Wood. It also occurs in the Togiak, Kuskokwim, and Yukon Rivers, which debouch into Bering Sea, and probably occurs in the Arctic streams of Alaska. The run in western Alaska begins usually early in June and extends generally to the early part of August. It begins earlier in Prince William Sound, however, and sometimes extends into September in southeast Alaska. The duration of the run averages about the same in each section.

**SILVER OR COHO SALMON.**

The silver or coho salmon (*O. kisutch*) is silvery in spring, greenish on the upper parts, where there are a few faint black spots. In the fall the males are mostly of a dirty red. The flesh in this species is of excellent flavor, but paler in color than the red salmon, and hence less valued for canning purposes.

This species has a maximum weight of about 30 pounds, with a general average of about 6 pounds.

The silver salmon is found as far south as Monterey Bay, where it appears during the month of July and is taken by the trollers. From Eel River, in California, north, it is found in most of the coastal streams. It usually appears in July and runs as late as November, the time of appearance and disappearance varying somewhat in different sections. Owing to its late appearance comparatively few, and they usually in the early part of the season, are packed by the canneries, most of which shut down in July and August. This fish also tarries but a short time about the mouth of the stream it is to enter, and is wary of nets, which makes it rather unprofitable to fish for the latter part of the season when it is running alone.

**HUMPBACK OR PINK SALMON.**

The humpback or pink salmon (*O. gorbuscha*) is the smallest of the American species, weighing from 3 to 11 pounds, the average being about 4 pounds. In color it is bluish above, silvery below, the posterior and upper parts with many round black spots, the caudal fin always having a few large black spots, oblong in shape. The males in fall are dirty red and are very much distorted in shape, a decided hump appearing on the back, from which deformity the species acquires its name. The flesh is softer than in the other species; it is pale in color, hence its canned name, "pink" salmon.

The southern limit of the fish is the Sacramento River, but only occasional specimens are found here and in the rivers to the northward until Puget Sound is reached. Here a large run appears every other year, the only place on the coast where such is the case.

The humpback occurs in varying abundance in the waters of British Columbia, but it is in the waters of southeast Alaska that it appears in its greatest abundance. Many of the canneries in this region depend mainly upon the humpback for their season's pack, and the canned product now occupies an excellent position in the markets of the world. The fish spawn in nearly all of the small, short streams.

In central and western Alaska the runs are much smaller and the humpback is not much sought after by the cannery men, who are usually able to fill their cans with the more valuable species.

In southeast Alaska the run begins in June and continues until September, or even later in some places. In western Alaska the period is somewhat shorter. In Puget Sound it continues until late in the fall.



**CHUM OR KETA SALMON.**

The chum or keta salmon (*O. keta*) reaches a maximum weight of 16 pounds, the average being about 8 pounds. When it first appears along the coast it is dirty silvery, immaculate or sprinkled with small black specks, the fins dusky, the sides with faint traces of grid-ironlike bars. Later in the season the male is brick red or blackish, and its jaws are greatly distorted. Its flesh is quite pale, especially when canned. It is especially good for freezing, salting, and smoking.

This species has a wide distribution. It is found as far south as San Francisco, but is not utilized commercially in California except on Eel River. It is found in most of the coastal streams from here north, being especially abundant from Puget Sound northward to southeast Alaska, both inclusive. In this region it is being utilized in greater abundance each year, as the market for it widens.

In central, western, and arctic Alaska the species occurs in varying abundance, but is utilized sparingly, except by the natives, with whom it is the favorite species dried for winter food.

The run of chum salmon comes later than that of any other species except the coho. In Alaska it begins in June, but the height of the season does not occur until late in August or early in September, and fish are found as late as November. In Puget Sound they run from about the middle of August till late in November, and practically the same is true in the Columbia River.

**STEELHEAD TROUT.**

The steelhead trout (*Salmo gairdneri*) is commonly classed as one of the salmons by the fishermen of the Pacific coast, and it has been included in this report on this account. In different localities the average weight is placed at from 8 to 15 pounds, while extreme sizes reach 45 pounds. The excellent quality of its flesh causes it to be highly prized for the fresh and frozen markets, but owing to its pale color only limited quantities are canned.

The principal center of abundance of this species is the Columbia River. It is found from Carmel River, Cal., north to central Alaska, and possibly has an even wider range in Alaska. It seems to be found in the rivers during the greater part of the year. In the Columbia River the spawning season is from February to May, in Puget Sound in the spring, and in southeast Alaska in May and June. The best commercial fishing is in January, February, and March. In California the catching of this species is restricted to hook and line fishing.

**AGE OF SALMON AT MATURITY.**

As practically all salmon which have the opportunity spawn but once and then die, knowledge of the age at which this occurs is of great interest both from an economic and scientific standpoint. Many attempts have been made to solve the problem with the sockeye

and king salmon, the most important commercially of the five species, by means of marking artificially reared fry, usually by clipping one of their fins before they are liberated, as noted elsewhere in this report, but with unsatisfactory results.

Fortunately, certain experiments carried on in Tomales Bay, Cal., and in New Zealand, where king fry were planted in streams not frequented by the species in question and the return of the adults noted, have yielded some interesting and accurate information on the subject. These indicated that the age was four or more years, as no run was reported until the fourth year.

A more certain method of determining the age of salmon has been developed in recent years through the adaptation by American scientists of the discovery by European investigators that the ridges observed on the scales of certain fishes indicated a period of growth of the animal itself.

Dr. Charles H. Gilbert, of Stanford University, as early as 1910, applied this method to the determination of the age of the various species of Pacific salmon. As to its application to the Pacific salmon and the general method followed, Dr. Gilbert has the following to say:

While the method is new as regards Pacific salmon, it has been experimentally tested and fully approved by the Fisheries Board of Scotland in the case of the Atlantic salmon, and is now universally accepted as furnishing reliable data as to the age and many other facts in the life history of that fish. It has been shown to be applicable also to various species of trout, and its value has been demonstrated in fishes as widely divergent as the carp, the eel, the bass, the flounder, and the cod. Descriptions of this scale structure and its significance have appeared in a large number of papers, both scientific and popular. It will suffice here to repeat that the scale in general persists throughout life, and grows in proportion with the rest of the fish, principally by additions around its border. At intervals there is produced at the growing edge a delicate ridge upon the surface of the scale, the successive ridges thus formed being concentric and subcircular in contour, each representing the outline of the scale at a certain period in its development. Many of these ridges are formed in the course of a year's growth, the number varying so widely in different individuals and during successive years in the history of the same individual that number alone can not be depended on to determine age. For this purpose we rely upon the fact that the fish grows at widely different rates during different seasons of the year, spring-summer being a period of rapid growth and fall-winter a season when growth is greatly retarded or almost wholly arrested. During the period of rapid growth the ridges are widely separated, while during the slow growth of fall and winter the ridges are crowded closely together, forming a dense band. Thus it comes that the surface of the scale is mapped out in a definite succession of areas, a band of widely spaced rings always followed by a band of closely crowded rings, the two together constituting a single year's growth. That irregularities occur will not be denied, and this is natural, inasmuch as growth may be checked by other causes than the purely seasonal one. Also a considerable experience is requisite for the correct interpretation in many cases, and a small residue of doubtful significance has always remained. This element is too small to affect the general results, and further investigation will almost certainly eliminate the doubtful cases altogether.<sup>a</sup>

<sup>a</sup> Age at maturity of the Pacific coast salmon of the genus *Oncorhynchus*. By Charles H. Gilbert. Bulletin U. S. Bureau of Fisheries, vol. XXXII, p. 4, 5.

As a result of his investigations up to this point, Dr. Gilbert presented the following conclusions drawn from the data collected:

1. The sockeye spawns normally either in its fourth or fifth year, the king salmon in its fourth, fifth, sixth, or seventh year, the females of both species being preponderatingly 4-year fish.

2. The young of both sockeye and king salmon may migrate seaward shortly after hatching, or may reside in fresh water until their second spring. Those of the first type grow more rapidly than the second, but are subject to greater dangers and develop proportionately fewer adults.

3. Coho salmon spawn normally only in their third year. The young migrate either as fry or yearlings, but adults are developed almost exclusively from those which migrate as yearlings.

4. Dog salmon mature normally either in their third, fourth, or fifth years, the humpback always in their second year. The young of both species pass to sea as soon as they are free swimming.

5. The term "grilse," as used for Pacific salmon, signifies conspicuously undersized fish which sparingly accompany the spawning run. They are precociously developed in advance of the normal spawning period of the species. So far as known, the grilse of the king salmon, coho, and dog salmon are exclusively males; of the sockeye, almost exclusively males, except in the Columbia River, where both sexes are about equally represented. The larger grilse meet or overlap in size the smaller of those individuals which mature one year later at the normal period.

6. Grilse of the sockeye are in their third year, of the king salmon in their second or third year, of the coho and the dog salmon in their second year.

7. The great differences in size among individuals of a species observed in the spawning run are closely correlated with age, the younger fish averaging constantly smaller than those one year older, though the curves of the two may overlap.<sup>a</sup>

Since 1910 Dr. Gilbert has devoted much of his time to investigations <sup>b</sup> along this line, especially on the sockeye, with most interesting and valuable results.

His observations on the sockeye runs of British Columbia indicate that they consist principally of four and five year fish and that these two classes appear during successive seasons in widely differing proportions; that each stream has its distinctive race of sockeye, the progeny returning at maturity to the parent stream; that sockeye fry rarely survive when they proceed to sea within the year in which they are hatched; and that sea feeding, with the consequent rapid growth, is the most important factor in producing early maturity, an equal number of years in fresh water producing comparatively little effect.

#### MARKING SALMON.

A favorite recreation for quite a number of Pacific coast people has been the marking of salmon fry in order to find out the age at which they return to spawn, the rate of growth, etc. Scattered through the reports of the various State fish commissions, and occasionally

<sup>a</sup> *Ibid.*, p. 21, 22.

<sup>b</sup> Contributions to the life history of the sockeye salmon. (No. 1.) By C. H. Gilbert. Report of British Columbia Commissioner of Fisheries for the year ended Dec. 31, 1913, with appendixes, p. R53-78. Contributions to the life history of the sockeye salmon. (No. 2.) By C. H. Gilbert. Report British Columbia Commissioner of Fisheries for the year ended Dec. 31, 1914, with appendixes, p. N45-75.

in the reports of the United States Bureau of Fisheries, are to be found detailed reports of such markings and the sometimes remarkable results attained, apparently, at varying periods subsequent to the marking.

All sorts of marks were employed. The favorite was the removal of the adipose fin, the experimenters appearing to be of the belief that the fish would miss this the least of any. However, the entire or partial removal of nearly every fin was practiced by some one or other of the many experimenters. Sometimes a V or a U was punched out of the tail or the gill cover, and in one or two instances a tag was employed.

In time these marking experiments became so numerous, and so imperfect a record was kept of them by any central authority, that frequently it was impossible to tell, when an apparently marked specimen was obtained, where and when it was marked, and as a result but little dependence could have been placed upon them even had there been no other factors conspiring to vitiate their value.

Fishermen are continually finding in their nets salmon which they feel sure have been marked by some hatchery. Scores of times in the course of his various investigations of the fisheries of this coast the writer has been told of or shown specimens which the fishermen thought had been marked. Many of these marks were on the side of the fish and represented an M or W, depending upon the angle from which viewed, and it was impossible, generally, to convince the fishermen that this mark was caused by the twine of his gill net pressing on the side of the fish. The obvious fact that a fish could not survive when in the fry stage the infliction of such a mark did not occur to them.

Frequently the scars left by the suctorial organs of the lamprey eel have been mistakenly supposed to be hatchery marks.

One of the most interesting cases of salmon marking, and one which drives home the necessity for accepting reports of returns from such markings with extreme caution, is that of F. M. Chamberlain, then naturalist of the Bureau of Fisheries steamer *Albatross*, on the Naha Stream in Alaska.

In August, 1903, 1,600 red salmon fry, reared for the purpose from the 1902 eggs, at the Fortmann hatchery of the Alaska Packers Association, near Loring, Alaska, were marked by Mr. Chamberlain by excising both ventrals with fine curved scissors. The fry were released in the Naha River as soon as marked, at which time they were about three months old.

In 1906 between 50 and 100 adult reds with ventral fins missing were reported by the superintendent of the hatchery at Yes Lake, which is located on the northern side of Behm Canal (Naha being on the southern side) and some 15 miles farther up the canal than the

mouth of Naha Stream. Some of these also had the adipose removed, this mark having also been used on some of the fry. At the Fortmann hatchery, where they were marked, only two of these fish were obtained in 1906.

From then on until 1912, a period of  $9\frac{1}{2}$  years, the return of a number of these supposedly marked fish is noted each year at the two hatcheries in question, the number reported in the last-named year being larger than in some of the intervening years. In the latter year Mr. Chamberlain himself pointed out the impossibility of these all being from the fry he had marked and no further attention was paid to them.

The principal thing that this and some of the other many experiments in salmon marking prove is that the percentage of salmon which accidentally lose, either through disease or the attacks of their many enemies, one or more of their fins, or portions of same, is much larger than most people suppose. Out of the many millions taken annually in commercial and fish-cultural operations it is not surprising that some should be minus such exposed portions of their anatomy and this percentage would doubtless be found to be considerable were particular attention directed toward it. As it is now, it is only occasionally that the fisherman notices such loss, or mentions the same when he does, unless his attention has been directed to it by particular inquiry. In the Chamberlain experiment, for instance, after 1907 considerable publicity was given to the search for such marked fish, and the writer, in his travels through southeast Alaska during the succeeding years until the end of 1911, frequently was told by fishermen that they had caught salmon with missing fins. Inquiry developed that while a few of the lost fins were the same as Chamberlain had excised, a number were entirely different fins, showing that when the attention of fishermen was directed especially in this line many deformed fish would be found.

The confusion resulting from the many marking experiments carried on by different people shows the absolute necessity of some central authority regulating them if any real results are to be achieved from this line of endeavor. In 1908 the Secretary of Commerce, under authority of sections 11 and 12 of the Alaska fisheries law, directed that any persons desiring to mark and release salmon in Alaska first consult with and secure the written consent of the Commissioner of Fisheries or of the agent at the salmon fisheries of Alaska. It would be an excellent thing if some such control could also be exercised over these operations in the coastal States.

During the year 1916 Dr. Charles H. Gilbert, of Stanford University, assisted by Willis H. Rich, conducted salmon-marking experiments on an extensive scale. Late in the fall of 1915 a consignment

of 100,000 eggs of the red salmon was forwarded to Seattle, Wash., from the station of the Bureau of Fisheries at Yes Bay, Alaska, of which 50,000 were reshipped to the Anderson Lake hatchery of the British Columbia Fisheries Department, located on the ocean side of Vancouver Island. The remaining 50,000 were sent to the Bureau of Fisheries hatchery at Quinault Lake, on the coast of Washington. The intention was as soon as the fry, hatched from these eggs, had developed into fingerlings to mark each lot with a distinctive marking and plant them in waters near the hatcheries, with the object of proving that the adult fish would return to the stream in which they had passed their early existence, no matter where the eggs were taken.

This plan could not be carried out at Anderson Lake, as the young fish resulting from the eggs, which were sent there, were not strong enough to survive the experiment. They were therefore liberated without marking. Those hatched at Quinault Lake were marked, however, and liberated in the summer of 1916. Dr. Gilbert has strong hopes that upon the return of the marked fish important data relating to the life history of the species will be obtained.

#### OCEAN HOME OF THE SALMON.

All sorts of conjectures have been hazarded as to the ocean home of the salmon after the young fish have gone to sea and disappeared apparently from the ken of man. Many have conjured up visions of vast schools of adult salmon surging along the coast hundreds of miles seeking for some suitable river in which to spawn, explaining in this wise the variations in the seasonal runs in different sections. Others think the fish go out into the greater depths of the ocean and there hide from man until the spawning instinct leads them back to the coast and thence to the stream in which they were born.

Discoveries of recent years have quite altered this uncertainty, and we now are reasonably certain that the vast majority of the salmon are comparatively near our coast line, while others stay in the bays, straits, and sounds virtually all the time when not in the rivers.

Some years ago it was first noticed that king salmon would take the hook while in salt and brackish waters. At first only the anglers were interested in this fact, but as the demand for king salmon for mild curing became more insistent the commercial fishermen, attracted by the high prices paid, began to devote some attention to the fish during the early spring months, and soon trolling became a recognized branch of the industry. It was first taken up on a considerable scale in southeast Alaska in 1905.<sup>a</sup> As the demand for the fish increased, the fishermen extended operations until almost all of southeast Alaska waters were being fished. The length of the fishing season was also

<sup>a</sup> Report on the fisheries of Alaska. By John N. Cobb. Bureau of Fisheries Document no. 618, p. 19-21.

increased until now only the severe weather of winter prevents them from fishing. However, the halibut trawls occasionally come up during the season with king salmon on them, showing that they are still on the ground.

The above is also true to a certain extent of the waters of British Columbia and Puget Sound and to a lesser extent, so far as has been disclosed, of Monterey Bay and the Oregon coast.

It has been known for some years that the silver, or coho, salmon would also take the hook under practically the same conditions as the king salmon, and the only reason this species has not been fished for to the same extent as the king has been because it was not large enough to be attractive to the mild curers, and hence there was a much lesser demand for it.

It had been supposed that the other species did not feed when in coastal waters, but Marsh and Cobb <sup>a</sup> state quite differently:

Other species of salmon, in addition to the king, are found to take the trolling hook. For several weeks in July trollers in Union Bay, in southeast Alaska, caught a number of cohos and humpbacks while trolling for kings. The humpbacks were caught mainly with a spoon, no bait being used. Most of them appeared to have been feeding on needlefish and herring, according to the cutter who dressed them. A few red salmon are reported to have been caught on the trolling line by fishermen operating for king salmon in the neighborhood of Mary Island, near Dixon Entrance. Several fishermen report having in previous years frequently taken dog salmon on a hook in the bays along Chatham Strait.

In 1909, Mr. J. R. Heckman, of Ketchikan, Alaska, a well-known cannery man, told the writer that, while he was trying to install a floating trap near Cape Chacon, at the lower end of Prince of Wales Island, southeast Alaska, he on several occasions observed red salmon feeding on what he called a red shrimp.

This was also observed in 1912, when Dr. Gilbert reported, in connection with his observations of salmon fishing on Swiftsure Bank, off the Straits of San Juan de Fuca, that "during the past summer it was observed by Mr. J. P. Babcock and the writer that the sockeye on the bank were feeding extensively on a small shrimplike crustacean (*Thysanoessa spinifera*, Holmes), which floats in incredible numbers on the tides and forms a favorite food for the other species as well as for the sockeye." <sup>b</sup> He also found all the other species feeding voraciously in this neighborhood.

These observations would tend to confirm the belief which has been steadily growing in favor for some years that the salmon either spend the greater part of their life in the bays, straits, and sounds, or else in regions adjacent to the coast line.

<sup>a</sup> The fisheries of Alaska in 1909. By Millard C. Marsh and John N. Cobb. U. S. Bureau of Fisheries. Document no. 730, p. 26.

<sup>b</sup> The salmon on Swiftsure Bank. By Charles H. Gilbert. Report of British Columbia Commissioner of Fisheries for year ending Dec. 31, 1912, p. 116.

The reason they had not been found in this region earlier is doubtless due to the fact that during the fall, winter, and spring months the weather on the north Pacific coast is such that fishing operations can not be carried on along the open coast, while in summer the fishermen are all busy on the spawning runs and have no time to devote to fish not yet arrived at maturity, which are probably feeding along the coast as usual.



## II. FISHING GROUNDS AND HISTORY OF THE FISHERIES.<sup>a</sup>

### WASHINGTON.

*Puget Sound.*—Strictly speaking, the name Puget Sound should be restricted to that long, narrow arm extending south from the Strait of Juan de Fuca, but a practice has developed, and is now common among fishermen and others, of designating all the great water area in the State of Washington comprising Puget Sound proper, Strait of Juan de Fuca, Canal de Haro, Rosario Strait, the Gulf of Georgia, and the smaller straits, bays, and sounds, as Puget Sound, and this practice, for the sake of convenience, has been followed in this report.

This great indentation in the coast, with its numerous islands and many fine harbors, has greatly aided the development of this portion of Washington and has been especially favorable to the prosecution of the salmon and other fisheries. Numerous rivers and creeks enter the Sound, the more important of these being on the eastern shore and comprising the Nooksack, Skagit, Stillaguamish, Snohomish, Duwamish, Puyallup, and Nisqually. On the southern and western shores the tributary streams are nearly all small, the more important being the Skokomish, Quilcene, Dungeness, and Elwha.

During the period when what is now the State of Washington was debatable ground between Great Britain and the United States, the Hudson Bay Co. annually salted considerable fish on Puget Sound and exported some to the Hawaiian Islands and Asia.

The first fishing operations by Americans were soon after the settlement at what is now known as Seattle, about 1852. For many years the catch was sold either fresh or salted, and the industry was small, as the population, for some years, was sparse. The extension of the railroad to Puget Sound, thus furnishing an outlet to the rapidly growing population in the Middle West, did much to aid the industry. This also gave opportunity to begin the shipping of fresh halibut and salmon to Eastern points. Ainsworth & Dunn, of Seattle, operating later under the name of the Seattle Fish Co., were the first successful pioneers in this branch of the industry, beginning about 1889, and carrying it on until they sold out in 1901, as noted later.

In 1903 the San Juan Fishing & Packing Co., which had begun the fresh-fish business in 1899, bought the business from the Pacific Packing & Navigation Co.

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<sup>a</sup> For some of the regions the historical data are fragmentary and can not be considered as other than historical notes. It is hoped that someone will write a history of the industry before all of the pioneers have passed away.

In 1897 the Chlopeck Fish Co. (now the Booth Fisheries Co.), which had been operating in Portland for several years, started a fresh fish and freezing business at Seattle.

The first salmon cannery on Puget Sound was erected by Jackson, Myers & Co., in 1877, at Mukilteo, in Snohomish County. The members of this firm had all been engaged previously in salmon canning on the Columbia River. The first pack was of 5,000 cases, composed wholly of silver, or coho, salmon. Later at this plant were put up the first humpbacks ever canned. In order to divert the minds of purchasers from the fact that the meat of the humpback was much lighter in color than the grades then known to the consuming public, the company printed on its label the legend, "Warranted not to turn red in the can." Even with this shrewd sizing up of the weak side of the consuming public the demand for humpback, or pink, salmon developed very slowly, and it was some years before it became a factor in the markets.

Within a year or two after the opening of the above plant another was started at Mukilteo by a man named Bigelow.

In 1880 the Myers' cannery was destroyed by a heavy fall of snow. It was rebuilt in West Seattle and was operated till 1888, when it was destroyed by fire. George T. Myers, now sole owner, built a new cannery at Milton, which was burned two years later, and he then came back to Seattle and built a cannery about where Ainsworth & Dunn's dock now stands. He remained here only one season, after which he moved to where the Pacific Coal Co.'s bunkers now are. Late in 1901 he sold out his plant to the United Fish Co., which company moved the plant to the foot of Connecticut Avenue, where they continued operations for two or three years and then quit.

In 1889 a man named Morse established a cannery at Seattle and operated it for only one year.

The first Puget Sound sockeye cannery was built at Semiahmoo, near Blaine, by J. A. Martin and John Elwood about 1887 or 1888. It was bought in 1892 for \$500 by D. Drysdale, who shortly afterwards rebuilt and greatly enlarged the plant. In the same year Mr. Drysdale demonstrated the commercial success of fish traps. Traps had been in operation before this, however. In 1893 Ainsworth & Dunn had a trap at Five Mile Rock, just beyond the light house at Magnolia Bluff (now a part of Seattle), and there had been a trap or two in Elliott Bay even prior to this. Traps had not been profitable in this section, however, owing to the cheapness and abundance of salmon, haul seines being cheaper and more profitable to operate. A man named Kirby, who came originally from Nova Scotia, and another named Goodfellow (now living at Point Roberts) put in the first trap for Mr. Drysdale.

In 1893 A. E. Wadhams, who had operated on the Columbia River for some years, established a sockeye plant at Point Roberts.

In 1894 both canneries were sold to their present owner, the Alaska Packers Association, an organization formed not long before this by a combination of a number of Alaska plants.

In 1895 three new canneries were built at Anacortes—one by Philip S. Cook (later owned by the Porter Fish Co. and now by the Anacortes Fisheries Co.), one by the Anacortes Packing Co. (now owned by the Alaska Packers Association), and the other by the Fidalgo Island Canning Co.

In 1896 J. R. Young and B. L. Williams built a small cannery at Blaine. They failed in 1900 through the failure of their trap fishing and J. W. & V. Cook Packing Co., of Portland, bought their plant and put J. L. Smiley in charge of it. In 1909 Mr. Smiley purchased this plant from the company and has since operated it.

As Ainsworth & Dunn found that they were receiving more salmon than they could dispose of in a fresh condition (they were first, in 1889, to ship fresh salmon from here to eastern points), the firm built a cannery on the Seattle water front, at what is now Pier 8, about 1895 or 1896, and about 1897 built another at Blaine.

About 1898 A. E. Devlin came up from the Columbia River and established a plant at Friday Harbor, which is now operated by the Friday Harbor Packing Co.

In 1901 Ainsworth & Dunn sold all its fresh fish and canned salmon holdings to the newly organized Pacific Packing & Navigation Co. When the latter company failed and its assets were sold in 1904, the former firm bought back its Blaine plant and has operated it ever since. Mr. Ainsworth, the senior member of the firm, died in 1914, but the business is still operated under the name of Ainsworth & Dunn.

The Pacific American Fisheries Co. was incorporated in 1899. The company purchased at the time of its organization the cannery and trap properties of the Island Packing Co., San Juan Island, and the cannery of the Franco-American North Pacific Packing Co.; at Fairhaven. The last-named cannery had been built the previous year.

By 1900 a number of canneries had been erected on the shores of Puget Sound, most of which were then in active operation. In 1901 the Pacific Packing & Navigation Co. was organized under the laws of the State of New Jersey, for the purpose of acquiring a number of salmon canneries on the coast. It was supposed to be backed by unlimited eastern capital, and its authorized capitalization was as follows: Common stock, \$12,500,000; 7 per cent accumulative preferred stock, \$12,500,000, and 6 per cent debentures, \$7,000,000. It actually issued \$6,037,000 common stock, \$6,963,000 preferred stock,

and \$3,000,000 debentures. Subsequently the management effected an exchange of preferred stock for debentures, increasing the former to about \$7,500,000 and decreasing the debentures to about \$1,650,000.

The new company purchased a number of canneries in Alaska, also the following Puget Sound plants: Pacific American Fisheries Co.'s canneries at Fairhaven (now Bellingham) and Friday Harbor; the Ainsworth & Dunn canneries at Blaine and Seattle, and the Fairhaven Packing Co. cannery at Fairhaven.

The company had a very short career, ending up in the bankruptcy courts in 1903, and when all its affairs were wound up the stockholders received nothing, while the bondholders got but an exceedingly paltry sum out of all the money put into it.

Most of the canneries secured on Puget Sound were repurchased by their former owners or by new people.

From this time on the industry fluctuated considerably, 41 canneries, an increase of 10 over 1914, being operated in 1915.

During the early years of sockeye canning they were not sold to the trade as sockeyes, but as Alaska reds and Columbia River salmon, for which there had been an established market for some years.

H. Bell-Irving & Co., now of Vancouver, British Columbia, were the pioneers in the labeling of the fish as sockeyes, this being in 1894-95. Like all virtually new products, sockeye salmon had a hard fight for several years to secure a foothold in the salmon markets, and it was not until the Spanish-American war in 1898 caused a heavy demand for canned foods that its position became finally established.

*Queets River.*—This river, which is about 35 miles long, rises in the northern part of Jefferson County and empties directly into the ocean in the northwestern part of Chehalis County, within the bounds of the Quinault Indian Reservation. A small salmon cannery was built at Queets, in Jefferson County, in 1905.

*Soleduck River.*—This is a small stream, about 30 miles in length, which flows through the southwestern part of Clallam County and empties directly into the ocean. The Quillayute Indian Reservation is located here and the natives formerly caught salmon and marketed them on Puget Sound, but a small cannery, started at Mora, on this river, in 1912 and operated each season since, has furnished a market for the catch.

*Quinault River.*—This river, which enters the ocean in the northwestern part of Chehalis County, has a length from the ocean to Quinault Lake of about 40 miles, wholly within the boundaries of the Quinault Indian Reservation.

This stream is especially noted for its long-continued annual run of Quinault salmon (*O. nerka*). These fish, which are noted for their especially red-colored flesh, make their appearance early in

December, when the Indians generally catch them for their own use, as they fear that, if the whites got hold of the fish, they might throw away the hearts. Should a heart be eaten at this time by a dog or chicken, the Indians believe the run would not come. In January, when the fish begin to be abundant, all danger of this seems to have passed, for the Indians then usually have a considerable number for sale, and these are generally shipped to distant markets in a fresh condition by the buyers. As soon as the canneries open at Moclips most of the fish are disposed of at that place. The run continues up to July 1. May and June are the best fishing months.

There is a fall run of chinooks in this river, which usually arrives in August and ends about October 15.

The silver salmon appear about October 1 and the run is generally over by November 15; the dog salmon appear about November 1 and the run is usually over by the middle of the same month, while the steelhead trout run between November 20 and May 1. None of the latter are canned.

Moclips, the terminus of the railroad, is about 10 miles from the river, and the fish are all taken by team to this place. Twenty fish, weighing approximately 100 pounds, are put in each box, and these are piled onto the wagons until a load has been accumulated. The team owners get 50 cents a box for hauling the loaded ones to Moclips and 5 cents a box for bringing the empty ones back.

In 1915 the records of the Indian agent show that the Indians fishing on the north side of the river caught 219,654 Quinault salmon, valued at \$49,820, while those on the south side caught 135,353 of these fish, valued at \$30,528.60, or a grand total of 355,007 fish, valued at \$80,348.60. This does not take into account the results of the fishing for the other species of salmon and steelhead trout, which quite materially swell the total.

Fishing is restricted to the Indians, who also make their own fishery laws, with the advice and approval of the Office of Indian Affairs, as the State laws have no force inside the bounds of the reservation. Under the regulations now in force, a clear channel of one-third the width must be left in the middle of the stream, which is from 250 to 300 yards in width. Each owner of a fishing location has to fish it in person; provided, however, that widows, orphans, minor children, old Indians, and those who are sick or have other gainful occupations are allowed to lease their locations or hire some one to fish them, and then only with the approval of the officer in charge.

During the Quinault season stake nets are used, while the rest of the time, as a result of the freshets, drift gill nets are used in the eddies. The stake nets are arranged in a rather peculiar manner. A line of stakes is run out for about one-third the width at right

angles to the shore, and to these are attached a net by short ropes. From each stake a section of net is run out and downstream, curving inward like a hook at the end, the latter part being held in place by three stakes.

The stake nets are 40 to 60 meshes deep, with  $5\frac{1}{4}$ -inch stretch mesh, and are set 85 yards apart. A set of these as described above forms one fishing location.

The chinook gill nets are usually  $8\frac{3}{4}$  to 9 inches stretch mesh and 24 meshes deep, while the gill nets for silvers, chums, and steelheads are of 7-inch stretch mesh and 35 meshes deep.

For some years the salmon from the Quinalt River were brought to Hoquiam and Aberdeen for canning. In 1911 W. W. Kurtz, of the former place, began the erection of a cannery at Moclips for the purpose of packing these fish, and the same season his example was followed by Frank Shafer. Mr. Kurtz still operates his plant, but the other is now owned by the Pacific Fisheries & Packing Co.

*Grays Harbor.*—This is the first important indentation on the coast of Washington south of Cape Flattery. It is about 40 miles long from east to west and about 20 miles wide in the widest part. The principal tributary is the Chehalis River, but there are a number of small streams which debouch into the harbor.

In 1883 B. A. Seaborg, who operated a cannery on the Columbia River, established a plant at what was later to be the thriving city of Aberdeen, although at that time it was practically a wilderness.

In 1902 the North American Fisheries Co. built a plant at Aberdeen. Shortly after it came into the possession of the Grays Harbor Packing Co., and on June 8, 1903, it was destroyed by fire. It was rebuilt and operated by this company until 1906, when it was sold to S. Elmore & Co., who still own it.

The Hoquiam Packing Co. built a cannery at Hoquiam in 1904 and have operated it ever since.

In 1910 two canneries were in operation at Aberdeen and Hoquiam, respectively, while in 1915 there were three at the former place and one at the latter in operation.

*Willapa Harbor.*—The entrance to this harbor, which also includes Shoalwater Bay, is about 27 miles south of Grays Harbor. The harbor runs east and west and is about 25 miles long. Shoalwater Bay extends south from it a distance of about 30 miles, its southern portion ending about a mile from the Columbia River and its western side being separated from the ocean by a spit varying in width from three-fourths to 1 mile. The bay is shallow, excepting in the main channel. The principal salmon streams entering the harbor are the Nasel and North Rivers, in which most of the pound or trap nets are located.

In 1884 B. A. Seaborg, a Columbia River canner, established a plant on Shoalwater Bay, as the whole of Willapa Harbor was then known.

About 1900 F. C. Barnes established a cannery at Sunshine, on the Nasel River, but the run of salmon on this river soon became so small that the plant was abandoned and the machinery moved to Mr. Barnes's cannery at South Bend.

In 1904 P. J. McGowan, the Columbia River canner, opened a cannery on the North River. Mr. McGowan, who was over 80 years of age at the time, had turned the control of his important Columbia River canning interests over to his sons, but finding idleness not to his liking, started this cannery in order to have something to occupy his time. He operated it for several years and then abandoned the project.

In 1912 the Chetlo Harbor Packing Co. established a cannery at Chetlo Harbor, but operated it only that year and in 1914.

In 1915 only two canneries, both of them at South Bend, operated on Willapa Harbor.

#### COLUMBIA RIVER.

The Columbia, which is the largest river of the Pacific coast, rises in British Columbia, flows through Washington, reaching the northern border of Oregon about 75 miles west of the State's eastern boundary; from this point the river forms the dividing line between Oregon and Washington, its general course being westerly. It empties into the Pacific at Cape Disappointment. Its principal tributaries are the Snake, John Day, Deschutes, and Willamette Rivers, and through these the main river drains an enormous extent of territory.

This river, which has produced more salmon than any other river in the world, has had a most interesting history. Many years before the white man saw its waters the Indians visited its banks during the annual salmon runs and caught and cured their winter's supply of food. Along the shores of the river at The Dalles for 15 miles were notable fisheries where various bands, who lived south and north, had their respective fishing locations, and to which all others were forbidden access. They used spears and dip nets in catching the salmon, the majority of which were dried and smoked for winter use.

A favorite preparation of the Indians who resorted to the river was pemmican. This was the meat of the salmon cleaned of the bones, pounded up fine, and then packed in hempen sacks of home manufacture. A sack of pemmican weighed from 80 to 90 pounds and was worth in barter as much as an ordinary horse.

It was about the year 1833 that a small trading sloop, under the command of Capt. Lamont, came into the Columbia River on one of her regular trips and dropped anchor near what is now known as St. Helens. While waiting several months for a return cargo the captain salted a number of barrels of chinook salmon, using old Jamaica rum kegs for the purpose. This is the first record of the export of this toothsome fish.

In 1861, H. N. Rice and Jotham Reed began packing salted salmon in barrels at Oak Point, 60 miles below Portland. The first season's pack amounted to 600 barrels. The venture proved fairly profitable and was soon participated in by others.

In the spring of 1866 William Hume, who had assisted in starting the first salmon cannery in the United States on the Sacramento River in 1864, finding the run of fish in the latter stream rather disappointing, started a cannery for Hapgood, Hume & Co. on the Columbia at Eagle Cliff, Wash., about 40 miles above Astoria.

The year this first cannery operated the following fishermen were operating in the river: Jotham Reed used a trap and a small gill net opposite Oak Point; Mr. Wallace fished a small seine from the shore of an island of that name a short distance below; John T. M. Harrington (who was later to establish the Pillar Rock cannery), in conjunction with a man named Fitzpatrick, operated a seine at Tenasillie, as did also a Mr. Welch; P. J. McGowan, who, with his sons, in 1884 started a cannery at McGowan, and later, at Warrendale, Ilwaco, etc., operated two small seines at Chinook Beach; and Hapgood, Hume & Co. had two small gill nets about 125 fathoms in length and 32 meshes deep. The gill net of Mr. Reed was much smaller than these. At this period the river literally swarmed with salmon, and the cannery had no trouble in packing 4,000 cases, which it increased to 18,000 the next year and to 28,000 cases in 1868.

In 1867 a crude cannery on a scow was started by S. W. Aldrich, a ship carpenter. The scow was about 50 by 20 feet, with a cabin on it, and in one end of this he constructed a brick furnace in which he set a large cast-iron cauldron for a cooker. Along one side he rigged a bench and manufactured the cans. Aldrich was a regular jack-of-all-trades, as he did everything from catching the fish to canning and cooking them ready for the market.

In 1868 a cannery was built near Eagle Cliff by one of the Humes, while in 1873 R. D. Hume built another at Bay View, Wash. He operated it until 1876, when Mr. Leveridge, of Leveridge, Wadhams & Co., of San Francisco, bought it and operated it during 1877 and 1878. George W. Hume took it then and a few years later sold it to David Morgan, jr., who got into financial difficulties, and the plant was ordered sold by the court. C. W. Fulton, of Astoria, later a United States Senator, had the matter in charge, but was unable to find a customer, and finally in desperation, offered it to



W. H. Barker, of George & Barker, for \$600. Mr. Fulton closed with him the same day. It proved a most profitable transaction for the purchasers, who acquired a million and a half labels which could be utilized, the machinery was taken out for other plants, the timber on the land belonging to the tract sold, and the floating property disposed of for a considerable sum, after which the stripped plant and land were sold back to Mr. Morgan for \$600, the purchase price. He sold it to George W. Hume, who wanted it to correct a title. It was sold for taxes a couple of years later and was bought in by B. A. Seaborg, who operated it for two years, since when it has been idle.

George W. Hume was the first salmon canner to employ Chinese. This was at Eagle Cliff in 1872. At this period the white laborers in the canneries were recruited from the riff raff and criminal element of Portland. He had a Chinese working for him and through this Chinaman secured a Chinese gang from Portland. This labor proved so satisfactory that the custom soon spread to the other canneries. It was not found that the Chinese could do the work any better or quicker than the white laborers, but they proved more reliable in their work and gave less trouble.

Of the 35 canneries on the Columbia River in 1881, it is said that about one-half had been established by the Hume brothers. G. W. and William Hume were partners in the firm of Hapgood, Hume & Co., on the Sacramento River, and established the first cannery on the Columbia. In 1881 William was the proprietor of two canneries, one at Astoria, Oreg., and one at Eagle Cliff, Wash. R. D. Hume, a third brother, in the same year had a cannery in operation on the Rogue River, and established three others, one at Eagle Cliff (then owned by William Hume), one at Rainier (then belonging to Jackson & Myers), and one at Astoria. The fourth brother, Joseph, came to the coast in 1871 and some time later established a cannery on the river.

One of the pioneer canners on the river was the late F. M. Warren, operating as the Warren Packing Co., who established a cannery at Cathlamet, Wash., in 1869. The same company is still operating the plant. Later another cannery was established at Warrendale, Oreg., and both are still being operated by this company. Mr. Warren was the inventor of a retort, patented on April 10, 1877, which was in use by the principal canneries on the coast for a number of years.

John West was another pioneer. He built a cannery at Hungry Harbor, Wash., about 1869. In 1881 he moved his plant to Westport, on the Oregon side of the river. Mr. West was the inventor of a packing machine for placing the fish in the cans.

In 1871 the firm of Megler & Jewett established a cannery on the present site of Brookfield, Wash., and named it in honor of Mrs. Meg-

ler's birthplace, North Brookfield, Mass. In 1876 the plant was greatly enlarged and J. S. Megler bought out his partner and took in Mr. Macleay, of Corbett-Macleay, wholesale grocers, of Portland and San Francisco, and changed the firm name to J. S. Megler & Co., under which title it still operates. In 1879 Mr. Megler bought out this partner and owned the plant until his death in 1915, since when it has been operated by his widow.

The first soldering machine used on the Columbia River was in this plant, while the steam box and lacquering machines were first put in use on the river in this plant.

In 1874 the Adair brothers, S. D. and John, jr., erected a cannery at Astoria, the second one to be built there. Before packing began, A. Booth, the well-known Chicago fish dealer, and progenitor of the present Booth Fisheries Co., acquired a half interest in the plant, which was then named A. Booth & Co. John Adair, jr., was the manager. The brothers established canneries on the Fraser River and in some seasons exchanged places in operating on the two rivers. S. D. Adair sold out his cannery on the Fraser and bought one on the Columbia and operated it under the firm name of S. D. Adair & Co. After selling out his interest in A. Booth & Co., S. D. Adair formed a partnership with Wm. B. Adair under the style of S. D. Adair & Co. in 1881. The brothers were active in the industry for a number of years.

J. O. Hanthorn, under the firm name of J. O. Hanthorn & Co., established one of the largest canneries on the river at Astoria in 1876. Mr. Hanthorn invented a rotary can washer for washing cans after they were filled ready for soldering and before the tops were put on.

In the same year Marshall J. Kinney began his long and interesting career in the canning business by establishing a cannery at Astoria.

The first fish trap, or pound, on the river was constructed by Mr. Graham, in Baker Bay, on the Washington shore, in 1879. In 1881 P. J. McGowan built some traps just below the bay. The traps were very successful at times.

The first purse seine on the river was operated by William Graham & Co. in 1906.

Below appears a list of the canneries operated on the Columbia River in 1881, together with the pack of each during the year in question:

J. Williams (Oregon side).....	9, 000
Astoria Packing Co.....	30, 000
Elmore Packing Co.....	7, 890
Astoria Fishery (M. J. Kinney).....	26, 000
Wm. Hume.....	20, 000
Geo. W. Hume.....	18, 000
Devlin & Co.....	20, 000
Occident Packing Co.....	15, 000

West Coast.....	15, 000
Badollet & Co.....	25, 000
Booth & Co.....	23, 000
Eagle Cannery.....	17, 300
Timmins & Co.....	8, 000
Fishermen's Packing Co.....	19, 000
S. D. Adair & Co.....	10, 000
Anglo-American Packing Co.....	10, 300
Hanthorn & Co.....	19, 000
Scandinavian Co.....	20, 000
J. W. & V. Cook.....	30, 000
F. M. Warren.....	12, 000
J. West.....	12, 000
Jackson & Myers (2 canneries).....	13, 000
Aberdeen Packing Co. (Washington Territory side).....	17, 000
Jos. Hume, Knappton.....	20, 225
Pillar Rock Co.....	15, 000
J. G. Megler & Co.....	25, 000
Columbia Canning Co.....	8, 000
R. D. Hume & Co.....	8, 300
Cathlamet Cannery.....	8, 000
Jas. Quinn.....	5, 000
Cutting & Co.....	20, 000
Eureka Packing Co.....	20, 000
Hapgood & Co.....	13, 000
Eagle Cliff Cannery.....	10, 000
Total.....	549, 115

The banner year in the canning industry was 1884, when 620,000 cases of chinook salmon were marketed. At this time the runs were so enormous that tons and tons of salmon were thrown overboard by the fishermen because the canneries were unable to handle them.

As in other sections there came a time when the market began to be glutted by the packs of the numerous canneries, and it was found necessary to combine some of the plants in order to operate more cheaply and also to reduce the output.

In 1885 W. H. Barker and George H. George, who had been connected with various canneries, formed a partnership as George & Barker and purchased the Astoria cannery of the Port Adams Packing Co., then 2 years old.

Shortly before this a combination which was named the Eureka & Epicure Packing Co., had been formed and comprised the following plants: Knappton Packing Co., Knappton; North Shore Packing Co., just below Knappton; and the Eureka Packing Co. This combination got into financial difficulties and the reorganizers persuaded George & Barker to join the combination and take charge, which they did.

In 1897 the Eureka & Epicure Packing Co., the plants of Samuel Elmore, M. J. Kinney and J. W. Seaborg, all at Astoria; J. O. Hanthorn & Co., Astoria; Fishermen's Packing Co., Astoria; Scandinavian

Packing Co., Astoria; Columbia Canning Co., and J. W. & V. Cook, Clifton, were combined under the name of the Columbia River Packers Association. In 1890 the association built a new cannery at Rooster Rock. Mr George was with the association until his death, but Mr. Barker left it to become general manager of the British Columbia Packers Association where he is at present, the dean of the Pacific coast cannerymen.

At the present time (1915) there are 19 canneries in operation on the river, while large quantities of salmon are also frozen, mild cured, pickled, smoked, and sold fresh in the markets of the world.

Commercial fishing is carried on mainly between the mouth of the Columbia and Celilo, a distance of about 200 miles, and in the Willamette River. The most of it is in the lower part of the river, within about 40 miles of its mouth. Bakers Bay, on the Washington or north side, and just within the river's mouth, is the favorite ground for pound-net fishing. The principal gill-net drifting ground is from the river's mouth to about 20 miles above Astoria, but drifting is done wherever convenient reaches are found much farther up the river. Most of the drag seines are hauled on the sandy bars in the river near Astoria, which are uncovered at low water. Wheels are operated in the upper river above the junction of the Willamette with the main river.

Astoria is the principal center for all branches of the industry, but more especially for canning. Other places in addition to Astoria at which canneries are located are Ilwaco, Eagle Cliff, Altoona, Brookfield, Pillar Rock, and Cathlamet, on the Washington shore, and at Warrendale, Rooster Rock, and Seuferts, on the Oregon shore.

#### OREGON.

*Necanicum Creek.*—This short stream is in Clatsop County and enters the Pacific Ocean about 10 miles south of the Columbia River. Its fisheries are of small importance.

*Nehalem River.*—The Nehalem is a small coastal river that rises in the mountains of Clatsop and Columbia Counties, and flows into the Pacific Ocean in the northern part of Tillamook County. As early as 1887 there was a small cannery here, and the business has been followed ever since. In 1911 an additional plant was built and both have operated each year since, except in 1913, when one was shut down.

*Tillamook Bay and River.*—Tillamook River is a very short stream which enters Tillamook Bay, the latter being in Tillamook County and about 45 miles south of the mouth of the Columbia River.

Fishing is carried on mainly in the bay. The earliest record we have of canneries on this bay is of 1886, when two were in operation. From 1891 to 1910 but one was operated, but in 1911 another plant was started, and both have been operated each season since, except in 1913, when one was shut down.

*Nestucca River.*—This stream enters the ocean in the southwestern part of Tillamook County. A cannery operated here in 1887 and the business has been carried on each season with but one intermission since 1905.

*Siletz River.*—This river has its source in the mountains of Polk County and enters the ocean in the northern part of Lincoln County. The commercial development of the fisheries was hampered for many years owing to the fact that the river was within the boundaries of what was then the Siletz Indian Reservation. The first cannery was established here in 1896, and it has operated nearly every season since.

*Yaquina Bay and River.*—The Yaquina ("crooked") River is about 60 miles long; its general course is nearly west through the county of Benton. The river is narrow throughout the greater part of its length. A few miles from its mouth it suddenly broadens out into an estuary from one-half to three-fourths of a mile wide, which is commonly called Yaquina Bay. The river enters the Pacific about 100 miles south of the Columbia.

Salmon canning was begun on this river in 1887, when two small canneries were constructed. The next year an additional plant was erected. The business has fluctuated considerably since then and there is now but one cannery, which has not been operated since 1911.

The fishing grounds are all in the bay and the lower section of the river. The fishermen of this section are fortunate in that they have railroad communication with the outside world, the only place on the ocean side of Oregon, except Tillamook, so situated. In 1915 another railroad line from Eugene to the mouth of the Siuslaw River, at which point it connected with a line to the Coquille River, was opened for traffic.

*Alsea Bay and River.*—Alsea River rises in the southwestern part of Benton County, and flows in nearly a northwesterly direction to the Pacific, a distance of about 60 miles. Like the Yaquina, the "bay" is merely a broadening out of the river just inside its mouth.

The first cannery was established in 1886 and by 1888 there were three in operation. For many years but one was operated. In 1911 and each season since two canneries have been operated.

The best fishing grounds are from the mouth of the river to about 5 miles inland.

*Siuslaw River.*—This river has its source in the mountains of Lane County, and its course lies first in a northwesterly direction and then to the westward until the Pacific is reached. Through part of its course it is the dividing line between Lane and Douglas Counties.

As early as 1878 there were two canneries operated on this river, but from 1879 till 1888 there are no data available showing the extent of the fisheries. In 1896 A. W. Hurd built a cannery which was

destroyed by fire in 1908. At present there are two canneries, but of recent years only one has been operated. The opening of a railroad line from Eugene to here, thus furnishing an outlet for fresh salmon shipments, will doubtless greatly help in developing its fisheries.

The salmon fishing grounds extend from near the mouth of the river to about 20 miles upstream.

*Umpqua River.*—With the exception of the Columbia this is the largest and longest river in Oregon. It is formed by north and south forks, which unite about 9 miles northwest of Roseburg, and the river then flows northwestwardly and enters the Pacific. Practically all of this river is within the boundaries of Douglas County, one of the largest counties in the State. A railroad has recently been built along this river and in time there will doubtless be a large development of the fisheries of this region owing to the opportunities which will be offered for shipping fresh fish.

With the exception of Rogue River, this is the only river in Oregon south of the Columbia River in which a spring run of chinook salmon occurs.

As early as 1878 there were two canneries located on the Umpqua, one of which was built by George W. Hume. The number has never been larger than this, and usually there has been but one operating. In 1912 there was but one, at Gardiner. In 1915 two were operated.

*Coos Bay and River.*—Coos Bay is a navigable semicircular inlet of the ocean with numerous arms or branches. There is much marshy ground in the bay, and a number of sloughs, or small creeks, which empty into the bay from both sides. Coos River proper is an unimportant stream, but a few miles in length. North Bend, Marshfield, and Empire are the principal towns on the Bay. A branch railroad is being built to these points from the main line of the Southern Pacific Railway, and as soon as this is completed the fishing industry will receive a great impetus. Heretofore this region has depended upon steamers and sailing vessels plying to Portland and San Francisco for its communication with the outside world, and this slow and infrequent means of shipment has very seriously handicapped the fisheries.

Salmon canning began here in 1887, when two canneries opened for business. The business has fluctuated considerably since, most of the time but one cannery being operated, and such being the case in 1915.

Fishing is carried on mainly in the bay. A few set nets are operated in the river.

*Coquille River.*—This river is formed by three branches, called the North, Middle, and South Forks, which rise in the Umpqua Mountains and unite near Myrtle Point, the head of tidewater, about 45 miles by river from the mouth of the stream. It is a deep and slug-

gish river, with no natural obstructions to hinder the free passage of fish. Its fisheries have been seriously hampered by the lack of railroad communication, but this has recently been remedied, as the railroad to Coos Bay connects with a short line now in existence between the Coquille River and Coos Bay, and thence on to the Siuslaw and from there to Eugene.

The principal towns on the Coquille River are Bandon, Prosper, Coquille, and Myrtle Point. Bandon is the shipping port.

Pickled salmon were cured and shipped from this river very early, the first recorded instance of any considerable quantity being in 1877, when 3,000 barrels of salmon were sent to San Francisco. The salt shipments were important until within recent years. The first salmon cannery was erected in 1883, at Parkersburg. In 1886 another was built at the same place, and the following year still another was erected close by. This was the largest number ever in operation in any one year. Since 1909 two canneries have been operated, both at Prosper.

The fishing grounds are from the mouth to Myrtle Point, about 45 miles inland.

*Sixes River.*—This small river is located in the northern part of Curry County, and is about 40 miles in length, entering the Pacific a very short distance above Cape Blanco. The salmon caught here are either salted or shipped fresh to the canneries on the Coquille River.

*Elk River.*—This is another small stream about 40 miles in length, which enters the Pacific just south of Cape Blanco. As on the Sixes River, the salmon are either salted or sold fresh to the canneries on the Coquille River.

*Rogue River.*—This river has as its source Crater Lake in the Cascade Mountains, on the western border of Klamath County, flowing a distance of about 325 miles to the ocean, which it enters at Wedderburn. Its principal tributaries are the Illinois, Applegate, and Stewart Rivers. Owing to canyons and falls in the main river between the mouth of the Illinois River and Hellgate, the latter near Hogan Creek, which runs through the town of Merlin, navigation and fishing are impossible in that section. Except at the mouth of the river the population is very sparse until about the neighborhood of Hogan Creek, where the river approaches the railroad, and from here on for some miles there are numerous growing towns.

Owing to the fact of there being both a spring and a fall run of salmon in this river, the fisheries early became of importance, although sadly hampered because of being compelled to depend wholly on vessel communication with San Francisco, many miles away. In the early years the salmon were pickled and shipped to San Fran-

cisco. In 1877 R. D. Hume, who had been canning salmon on the Columbia River, removed to the Rogue River, and established near the mouth a cannery which he operated every season (except 1894, when the cannery burned down) until his death in November, 1908, after which date it was operated by his heirs. Mr. Hume also operated a large cold-storage plant at Wedderburn for several years.

The development of the fisheries of the lower Rogue River was very much hampered by the monopoly which Mr. Hume acquired and maintained until his death. He bought both shores of the river for 12 miles from its mouth, and also owned an unbroken frontage on the ocean shore extending 7 miles north from the mouth of the river. As a result of this, independent fishermen could find no convenient places for landing, which was necessary in order to cure, handle, and ship the fish caught. Since Mr. Hume's death the property has been sold to the Macleay estate, but the people of Oregon, upon an initiative and referendum petition, voted in 1910 to close Rogue River to all commercial fishing, and it was so closed in 1911 and 1912, but reopened in 1913. A second cannery was built here in 1915 by B. A. Seaborg & Co.

In the upper river ranchers living along the banks have engaged in fishing for a number of years, the catch for the most part being sold fresh. In recent years, as the country has developed, this fishery has become fairly important.

*Chetco and Windchuck Rivers.*—These two unimportant streams empty into the Pacific in the lower part of Curry County, not far from the California line. The former is about 20 miles and the latter about 25 miles in length. Both have runs of salmon, and small fisheries have been maintained for some years, the catch being either pickled or sold to the California canneries.

#### CALIFORNIA.

*Smith River.*—This river, which is the most northerly one in the State, rises near the Siskiyou Mountains, and runs in a westerly direction to the Pacific Ocean.

The river has only a spring run of salmon, and the early recorded history of the fisheries is fragmentary. The pickling of salmon was the main business at first and has been important ever since, as the cannery, which was first established in 1878, operated irregularly, and seems to have shut down entirely in 1895. Canning began again in 1914 by H. E. Westbrook and continued in 1915.

*Klamath River.*—This is the most important river in California north of the Sacramento. It issues from the Lower Klamath Lake in Klamath County, Oreg., and runs southwesterly across Siskiyou County, passes through the southeastern section of Del Norte County,



keeping its southerly course into Humboldt County, where it forms a junction with the Trinity River, and thence its course is directed to the northwest until it reaches the Pacific Ocean.

The Klamath River is important as a salmon stream because it has both a spring and fall run of salmon. In 1888 a cannery was established at Requa, at the mouth, and this has been operated occasionally ever since. The pickling of salmon has been done here for a number of years. Some years part of the catch has been shipped fresh to the cannery on Smith River or to the Rogue River (Oreg.) cannery. Since 1908 the cannery has been operated continuously by the Klamath River Packers Association.

*Humboldt Bay and tributaries.*—The shore line of Humboldt County is bold and high, except in the vicinity of Humboldt Bay, where it is rather flat. The latter is the only harbor along the county shore, and it is quite difficult of access, owing to the bar at the entrance, upon which the sea breaks quite heavily. The bay is about 12 miles long and about 3 miles wide. Mad River, which has its rise in the lower part of Trinity County, runs in a northwesterly direction, then makes a sharp turn and enters the bay from the north side. Eel River, which has its rise in Lake County, far to the southeast, runs in a northwesterly direction and enters the bay at its southern extremity. Small railroads running south from Eureka traverse the shores of both rivers for some miles. A railroad now runs from the north side of San Francisco Bay to Eureka, and it has aided very materially in extending the market for salmon caught in these rivers.

*Mattole River.*—This is a small and unimportant river in the southern part of Humboldt County, and is said to have a good run of salmon each year, but no commercial fishing has as yet been carried on here.

Some salmon fishing is now (1915) carried on at Fort Bragg, in Mendocino County. The Noyo River debouches into the ocean at this place. Shipping salmon from here is now possible, owing to a branch railroad having been built to the coast at this point. It is probable that, as other points in the region between San Francisco and Humboldt Bays are made accessible by the railroad, the salmon fishery will be expanded very considerably.

*Sacramento and San Joaquin Rivers.*—These two rivers are the most important in California. The Sacramento is quite crooked, the distance by river from Red Bluff to San Francisco being about 375 miles, while the distance by rail between these two places is only 225 miles. The river rises in several small lakes in the mountains about 20 miles west of Sisson, in Siskiyou County, and for nearly half its length flows through a narrow canyon. The upper portion is a typical mountain stream, with innumerable pools and rapids. A

little above Redding the river emerges from the canyon and widens into a broad shallow stream. Below Sacramento it runs through a level country and is affected by tides. Sloughs are numerous in this stretch, some connecting it with the San Joaquin. The Sacramento and San Joaquin Rivers join as they empty into Suisun Bay.

The principal tributaries of the Sacramento which are frequented by salmon are the Pit and McCloud Rivers and Battle Creek. At one time salmon frequented the American and Feather Rivers, but mining and irrigation operations along these streams either killed them off or drove them away.

The San Joaquin River has its source in the Sierra Nevada Mountains. Flowing westerly and forming the boundary between Fresno and Madera Counties for a considerable distance, it then turns abruptly to the north just where it is joined by Fresno Slough, which drains Lake Tulare. From here its general course is northwesterly until it joins the Sacramento River, near the latter's mouth. The Chouchilla and Fresno Rivers are the principal tributaries of the San Joaquin.

The principal fishing grounds for salmon are Suisun Bay, the lower part of San Joaquin River, and the Sacramento River as high as the vicinity of Sacramento. Drift gill nets are used almost exclusively in this section. From Sacramento to Anderson there is considerable commercial fishing, more particularly with haul seines.

Owing to the early and excellent railroad facilities which the fisheries of the Sacramento River have enjoyed, they have not been handicapped so seriously as most of the other Pacific coast rivers in finding profitable outlets for the catch. Soon after the first trans-continental line was opened the shipping of fresh salmon to eastern points began, and it has been an important feature of the industry ever since.

The chief event in the history of the salmon fisheries of this river is the fact that the canning of salmon on the Pacific coast had its inception here in 1864. The circumstances leading up to this event and its consummation are interestingly told by R. D. Hume:

The first salmon cannery of the United States was located at Washington, Yolo County, Cal. A part of the building was originally a cabin situated on the river bank outside of the levee just opposite the foot of K Street, Sacramento City. It was built in 1852 and occupied by James Booker, Percy Woodsom, and William Hume. William Hume came to California in the spring of 1852, bringing with him a salmon gill net which he had made before leaving his home at Augusta, Me. In company with James Booker and Percy Woodsom, Mr. Hume began fishing for salmon in the Sacramento River just in front of the city of Sacramento. William Hume had been salmon fishing in the Kennebec River in the State of Maine with his father, where his father and grandfather had been engaged in the same business since 1780, and their ancestors in Scotland had for pleasure pursued the sportive salmon on the Tweed and

Tay for centuries before. In 1856 William Hume went back to **Maine**, and on his return to California the same year was accompanied by his brothers, John and G. W. Hume, who also engaged in salmon fishing in the Sacramento River. Among the schoolmates of G. W. Hume was one Andrew S. Hapgood, who had learned the tin-smith's trade, and who a short time after G. W. Hume left for California went to Boston and entered the employ of J. B. Hamblen, a pioneer in the canning business, and was sent by him to Fox Island on the coast of Maine to engage in canning lobsters. The canning of lobster was a new and growing industry, and Mr. Hamblen, to increase his business, a short time after sent Mr. Hapgood to the Bay of Chaleur, an arm of the sea which divides the Province of Quebec from that of New Brunswick, where, in addition to the canning of lobster, they also canned a few salmon. I believe this was the first salmon canned on the American Continent, and I am informed that the business in a small way is still carried on in that section of the country. In 1863 G. W. Hume went back to Maine, and while there visited Mr. Hapgood at Fox Island, to which place he had been again sent by J. B. Hamblen to take charge of the works at that place. During the visit of G. W. Hume to his friend Hapgood a talk about salmon was had, and it was agreed that if salmon on the Pacific coast were as plentiful as represented by Mr. Hume much money could be made in a salmon-cannery business. The plan decided on was that G. W. Hume, on his return to California, should try and induce his brother William to engage in the business with them, and, if he succeeded in so doing, Mr. Hapgood should purchase the necessary machinery and come out to California in time for the spring season of 1864. William Hume being agreeable to take part in the enterprise, Mr. Hapgood set out on the journey and arrived at San Francisco on March 23, 1864, and a few days later at the location where the operations were afterwards conducted.<sup>a</sup>

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For a considerable time after the salmon-canning business was inaugurated the packers suspended operations in the early part of July of each year, as at that time the market would take only goods which showed a rich oil and the best food values.<sup>b</sup>

The business languished after the firm established its cannery on the Columbia River, but in 1874 was renewed again by others and continued with varying success until 1905, when it ceased temporarily, owing to the smaller quantity of fish available and the difficulty of competing with the mild-cure packers and the fresh-fish dealers. Several times since small packs have been made when, for some reason, mild-curing was unprofitable.

*Monterey Bay.*—The first harbor south of San Francisco is Monterey Bay, a large indentation cutting into Santa Cruz and Monterey Counties. Only a portion of it is well sheltered, however. For a number of years it had been known that salmon frequented the waters of this bay for the purpose of feeding on the young fishes which swarmed there. Sportsmen frequently caught them with rod and reel, but it was not until the early eighties that the industry was established on a commercial basis. It has since grown very rapidly. The catch has either been mild cured at Monterey or shipped fresh. A few were canned in 1915.

<sup>a</sup> The description of the machinery used and the methods of canning have been quoted in full under "Canning" elsewhere in this report.

<sup>b</sup> The first salmon cannery. By R. D. Hume. *Pacific Fisherman*, Seattle, Wash., vol. II, no. 1, January, 1904, p. 19-21.

ALASKA.<sup>a</sup>

Alaska is the most favored salmon-fishing region. Many rivers, some of great length and draining enormous areas, intersect the district in every direction, while the number of small creeks is countless. Almost every one of these have runs of salmon of varying abundance. The principal streams entering Bering Sea are the Yukon, Kuskokwim, Togiak, Nushagak, Kvichak, Naknek, Ugaguk, and Ugashik; in central Alaska the Chignik, Karluk, Alitak, Susitna, and Copper Rivers are the main streams, while in southeast Alaska are found, among many others, the Anklow, Situk, Alsek, Chilkat, Chilkoot, Taku, Stikine, and Unuk Rivers. Most of the fishing in Alaska is carried on in the bays into which these rivers debouch. In southeast Alaska, which is composed largely of islands, the fishing is carried on mainly in the bays, sounds, and straits among these.

Even before the purchase of the district from Russia in 1867 our fishermen occasionally resorted to southeast Alaska and prepared salted salmon. The salmon fisheries did not become important, however, until canning was begun.

## SOUTHEAST ALASKA.

One of the most favorable sections for carrying on fishing operations is southeast Alaska. Here a narrow strip of mainland, about 30 miles wide, separates British Columbia from salt water and forms the "panhandle" of Alaska. Outside this is a fringe of numerous islands, large and small, close to the coast line, conforming to its irregularities and separated from it and from each other by deep straits and channels. These islands, about 1,100 in number, extend from the coast an average distance of about 75 miles and along the general contour for about 250 miles. Some of these islands are very large, indented with deep bays and sounds, and they in turn fringed with smaller islands.

The largest streams in this region are the Unuk, Stikine, Taku, and Chilkat, all of which take their source in the interior and drain considerable areas. The other rivers are usually streams, and the greater number are simply outlets to a lake or system of lakes.

All species of salmon are to be found in this region, but the humpback is by far the most abundant.

This region has been the favorite fishing ground for the smaller operators, although a few of the largest canneries in Alaska are located here. Of recent years transportation facilities have been exceedingly good and fairly cheap, while the nearness to the States

<sup>a</sup> The material for the history of the salmon fisheries of Alaska for the period from the inception of salmon canning to 1900 was obtained almost wholly from the following excellent and valuable reports by Capt. Jefferson F. Moser, U. S. N., to whom I am deeply indebted for this and other valuable data:

The salmon and salmon fisheries of Alaska. Report of the operations of the United States Fish Commission steamer *Albatross* for the year ended June 30, 1898. By Jefferson F. Moser. Bulletin U. S. Fish Commission, vol. xviii, p. 1-178.

Alaskan salmon investigations in 1900 and 1901. By Jefferson F. Moser. Bulletin U. S. Fish Commission, vol. xxi, p. 173-398.

and the considerable resident population which could be drawn upon for labor have been big factors in its development.

The Russians did considerable salting of salmon. Petroff, in his report in the Tenth Census on the "Population, industries, and resources of Alaska," writes as follows of the Redoubt near Sitka: "The once famous Redoubt or deep-lake salmon fishery on Baranof Island, which at one time during the Russian rule supplied this whole region, and whence 2,000 barrels of salmon were shipped in 1868, now lies idle."

One of the earliest operators in southeast Alaska was a Greek, or Slav, named Baronovich, who married the daughter of Skowl, one of the old-time chiefs of the Kasaans, and received from him the fishery on Karta Bay, a part of Kasaan Bay, and one of the best red salmon streams south of Wrangell Narrows. Baronovich built a saltery here, kept a store and traded with the Indians. He died some years ago, and for some time after his death his sons operated it. It finally collapsed a couple of years ago.

For a number of years a saltery was operated at Klawak, on the west coast of Prince of Wales Island. In 1878 the North Pacific Trading & Packing Co. purchased the saltery and erected the first cannery in Alaska here. A pack was made the same year, and the plant has operated every year since. In 1899 the cannery burned down, but it was immediately rebuilt on the opposite side of the bay. For some years this plant was operated almost exclusively with native labor, and at the present time the majority so employed are natives.

The same year that the above cannery was established the Cutting Packing Co. built a cannery at old Sitka, and operated it in 1878 and 1879, after which time it was closed down. In 1882 the machinery was taken by another company to Cook Inlet.

In 1882 M. J. Kinney, of Astoria, under the name of the Chilkat Packing Co., built a cannery on the eastern shore of the inlet and made a pack the same year. The cannery changed hands several times and finally was burned in 1892, and not rebuilt. The cannery packed every year from 1883 to 1891, both inclusive, except in 1888, when it was closed.

In 1883 the Northwest Trading Co., built a cannery on Pyramid Harbor, a little bay on the western side of Chilkat Inlet. It was operated by this company in 1883 and 1884, was idle in 1885, and in 1888 was sold to D. L. Beck & Sons, of San Francisco, and operated by that firm. In the spring of 1889 it was burned, but was rebuilt at once and a pack made that year. In 1893 it joined the Alaska Packers Association, which operated it, except in 1905, until the end of the season of 1908, when it was finally abandoned.

On the north shore of Boca de Quadra, about 8 miles from the entrance, a cannery was built in 1883 by M. J. Kinney, of Astoria, and

operated under the name of the Cape Fox Packing Co. from 1883 to 1886. Late in the last-named year it was sold and moved to Ketchikan and operated there under the name of the Tongass Packing Co. during 1887, 1888, and until August, 1889, when it was burned and not rebuilt.

In 1886 Rhode & Johnson erected a saltery at Yes Bay. The following year the firm became Ford, Rhode & Johnson. In 1887 work was begun on a cannery which was finished in 1888. Packing was begun in 1889 under the name of the Boston Fishing & Trading Co. In 1901 it was included in the Pacific Packing & Navigation Co. consolidation, and when that concern failed was purchased in 1905 by the Northwestern Fisheries Co. In 1906 the cannery was purchased by C. A. Burekhardt & Co., who have operated it each year to date, either under that name or subsequent incorporations known as the Yes Bay Canning Co., and the Alaska Pacific Fisheries.

In 1887 the Aberdeen Packing Co. of Astoria, Oreg., built a cannery on the Stikine River, about 8 miles above the mouth. In 1889 the cannery was moved to Point Highfield, on the northern end of Wrangell Island, and operations commenced under the name of the Glacier Packing Co. In 1893 it joined the Alaska Packers Association, who have operated it continuously, except in 1905.

The Loring cannery of the Alaska Packers Association was built in 1888 by the Alaska Salmon Packing & Fur Co. of San Francisco and operated by the Cutting Packing Co. For a number of years previous to this time a saltery had been in operation here. When the Alaska Packers Association was formed in 1893 it joined that organization. The cannery has been operated every year since it was built, and in some seasons has made the largest pack of any in the Territory.

Shortly after William Duncan and his community of Tsimpsaan Indians had settled, in 1887, on Annette Island, which island had been set aside by the Federal Government as a reserve for them, plans were under way for a salmon cannery, but funds came in so slowly that it was not until 1890 that any pack was attempted. In 1891 it was in full operation, and operated from then continuously until 1913, when the plant was shut down for that and the two succeeding years. Much dissatisfaction had been expressed by the natives over the operation of this and other industrial plants on the island, and finally the Federal authorities took possession of practically everything, as guardian of the natives, and early in 1916 leased the cannery to P. E. Harris & Co., of Seattle, the understanding being that they were to employ natives when available. Unfortunately the plant burned down just before the fishing season began.

James Miller operated a saltery on Burroughs Bay, on Behm Canal, in 1886 and 1887. In 1888 Andrew and Benjamin Young, of Astoria, Oreg., built a cannery here and operated it under the

name of the Cape Lees Packing Co. in 1888, 1889, and 1890. It was closed in 1891 and 1892. In 1893 it became a part of the Alaska Packers Association, and was dismantled the following year.

About 1888 a saltery was established on Thorne Bay, Prince of Wales Island. The following year it was sold to the Loring cannery. In 1892 it was sold to Robert Bell, who moved it to the upper end of the northwest arm, on the western shore. Salting was not carried on each season, as it was sometimes found to be more profitable to sell the fish fresh to the canneries. The plant was finally abandoned.

In 1889 Messrs. Sanborn and Ellmore, of Astoria, built a cannery in Pavlof Harbor, Freshwater Bay, on the eastern side of Chichagof Island, and operated it under the name of the Astoria & Alaska Packing Co. It made a pack that year and in the spring of 1890 was moved to Point Ellis, on the eastern side of Kuiu Island, packing that year and also in 1891. It was burned in May, 1892; only one building was left standing, and it and the site were purchased by John H. Mantle, of Wrangell, who operated a saltery on each arm of the bay. Mr. Mantle began operations here in 1893.

In 1889 the Baranof Packing Co. built and first operated a cannery at the Redoubt, about 12 miles below Sitka. It was also operated in 1890 and then moved to Redfish Bay, on the western coast of Baranof Island. It made its first pack here in 1891 and was then operated every year until 1898, when it was sold to the Alaska Packers Association and dismantled.

In 1889 the Thlinket Packing Co., organized at Portland, Oreg., built a cannery at Point Gerard, on the mainland opposite Point Highfield, at the head of Wrangell Island. It was operated that and the subsequent year.

In 1901 this company built another cannery at Santa Anna, on the north side of Cleveland Peninsula, and made a pack the same year.

In 1901 both plants became part of the Pacific Packing & Navigation Co. In 1902 the Gerard Point plant was closed and was not opened again. In 1903, 1904, and 1905 the Santa Anna plant was closed also. Early in 1905 these plants were purchased by the Northwestern Fisheries Co. at the assignee's sale of the old corporation's properties. The Santa Anna plant was operated in 1906 and has been operated each year since.

The Chilkat Canning Co. put up a plant at Chilkat village, on Chilkat Inlet, in 1889. It was operated from 1889 to 1893, and then sold to the Alaska Packers Association. It was held in reserve for some years but was finally dismantled.

In 1889 D. Blauw, of Tacoma, Wash., built a saltery on Grouse Island, Boca de Quadra, and dry-salted dog salmon. He operated only one season.

In 1890 a cannery was built by the Bartlett Bay Packing Co. on Bartlett Bay, Icy Straits, and operated by Williams, Brown & Co., of San Francisco. A saltery was constructed here prior to that date, and in 1889 a pack of 4,300 cases was made in a crude way. In 1891 the ice piled up in Glacier Bay to such an extent that the cannery could do almost nothing. It was not operated after this date. In 1893 it became a part of the Alaska Packers Association and was dismantled in 1894.

About 1890 a saltery was established on the north shore of the mouth of Quadra Stream, on Boca de Quadra, by Clark & Martin. It was operated intermittently until about 1898, when it was abandoned. The same parties also established a saltery at Ketchikan shortly after the one on Quadra Stream was built, and operated this until about 1898, when the plant was turned into a steamer wharf and warehouse for the new town of Ketchikan which was building up around it.

In 1896 the Pacific Steam Whaling Co. built a cannery on the northern side of Hunter Bay, near the southern end of Prince of Wales Island, and made a pack the same year. Miller & Co. had a saltery at this place and it was purchased by the company and removed to make room for the cannery. Miller & Co. also had a saltery on Nutqua Inlet, which was built in 1896, and this also was sold to the canning company. In 1901 the cannery became a part of the Pacific Packing & Navigation Co. It was closed in 1904. Upon the dissolution of the company in 1905 this plant was purchased by the Northwestern Fisheries Co., which company, after keeping it closed in 1905 and 1906, has operated it each season since.

The Quadra Packing Co. built a cannery on Mink Arm, in Boca de Quadra, in the spring of 1896 and made its first pack that year. In 1901 the plant was purchased by the Pacific Packing & Navigation Co. It was closed in 1904, 1905, and 1906. Upon the dissolution of the company in 1905 the plant was purchased by the Northwestern Fisheries Co. It was reopened in 1907 and has been operated each season since.

In 1897 a saltery was built on Taku Point, near the head of Taku Inlet. In 1898 and 1899 it was operated by the Quadra Packing Co. In 1900 the Icy Straits Packing Co. operated it.

In 1897 a small saltery was in operation by Cyrus Orr at Point Barrie, Kupreanof Island. In the same year Walter Kosmikoff operated a small saltery at Shipley Bay, on Prince of Wales Island. In 1900 he sold it to the Icy Straits Packing Co.

Fred Brockman in 1897 built and operated a small saltery on Sarkar Stream, Prince of Wales Island. Mr. Brockman operated this saltery intermittently until his death in 1915.



In 1897 Banter & West were operating a saltery at Sukkwan, on Sukkwan Island. In the same year Miller & Co. started another saltery on Kassook Inlet, on Sukkwan Island, while Thomas McCauley was operating a saltery on Whale Passage.

In 1899 the Icy Straits Packing Co., consisting of stockholders of the Quadra Packing Co., built a cannery and sawmill at a point on the southeastern shore of Wrangell Narrows, about a mile south of the northern entrance to same, and named the town site Petersburg. The cannery was ready and operated in 1900. In 1901 it became a part of the Pacific Packing & Navigation Co. It was closed in 1903, 1904, and 1905. In 1905 it was purchased at the sale of the company's properties by the Northwestern Fisheries Co. In 1906 the Pacific Coast & Norway Packing Co., which had been operating a cannery at Tonka, on Wrangell Narrows, purchased this plant and transferred its activities to the latter. In 1915 the plant was leased to the Petersburg Packing Co., composed of stockholders of the old company.

In 1900 the Western Fisheries Co., of Portland, built a cannery at the head of Dundas Bay, and made a pack the same year. In 1901 it became a part of the Pacific Packing & Navigation Co. It was closed in 1904. At the assignee's sale of the company's properties in 1905 this plant was purchased by the Northwestern Fisheries Co. and operated in 1905 and each subsequent year.

In 1900 the Fidalgo Island Packing Co. built a cannery on the southern side of Ketchikan Creek. A pack was made the same year. The plant was closed in 1903, only a little salting being done that year, but was opened in 1904. It was closed again in 1905, but opened in 1906. Since then it has been operated each season to date, except in 1909.

In 1900 the Pacific Coast & Norway Packing Co. operated a floating saltery while prospecting for a cannery location. In 1901 the company built a cannery at Tonka, about midway of Wrangell Narrows, on the western side, and made a pack in that and subsequent years until 1906. In that year the company purchased the Petersburg cannery and thenceforth operated from there. The Tonka plant was dismantled a few years later.

In 1900 the Royer-Warnock Packing Co., of San Francisco, built a small cannery on Beecher Pass, which connects Duncan Canal with Wrangell Narrows, using the old Buck saltery for the cannery proper. It operated only the one season. It was a hand-pack plant.

The Taku Fishing Co. in 1900 built a cannery on the southern side of the entrance to Port Snettisham, and made a pack in that year. In 1901 it became a part of the Pacific Packing & Navigation Co. The plant was closed in 1902 and not opened again.

In 1900 the Taku Packing Co., organized in Astoria, Oreg., built a cannery on the western shore of Taku Inlet, and made a pack the same year. In 1901 it became a part of the Pacific Packing & Navigation Co. It was closed in 1904 and not reopened again. In 1905 it became the property of the Northwestern Fisheries Co.

In 1900 the Chilkoot Packing Co., organized at Aberdeen, Wash., built a cannery at the head of Chilkoot Inlet, and operated the same year. In 1901 it became a part of the Pacific Packing & Navigation Co. It was closed in 1904 and not reopened again.

In 1900 the Great Northern Fish Co. operated a floating saltery. Its principal business was salting dog salmon for the Japanese trade, and it operated only one season. J. E. Rice, of Whatcom, Wash., in the same year packed dog salmon on Karta Bay for the same trade.

The Pacific Packing & Navigation Co. (an account of whose inception, operation, and failure appears under Puget Sound) was organized in 1901 and acquired the following canneries in Alaska: Canneries of Pacific Steam Whaling Co. at Nushagak, Bristol Bay; Chignik, Alaska Peninsula; Uyak, Kodiak Island; Kenai, Cook Inlet; Orca, Prince William Sound; Hunter Bay, southeast Alaska. Also the Hume Bros. & Hume canneries at Chignik and Uyak; the Thlinket Packing Co. with canneries at Gerard Point and Santa Anna; the Western Fisheries Co. cannery at Dundas Bay, Icy Straits; Chilkoot Packing Co. cannery at Chilkoot Inlet; the Taku Packing Co. cannery at Taku Inlet; the Taku Fishing Co. cannery at Port Snettisham; the Boston Fishing & Trading Co. cannery at Yes Bay; the Chatham Straits Packing Co. cannery on Sitkoh Bay; the Icy Straits Packing Co. cannery at Petersburg, Wrangell Narrows; and the Quadra Packing Co. cannery at Mink Arm, Boca de Quadra.

The company met with financial disaster in 1904, and at the resulting sale most of its properties were bought by the Northwestern Fisheries Co., a corporation formed for the purpose. Of the Alaska canneries the Sitkoh Bay plant was sold to George T. Myers & Co., while the Orca plant was leased to Capt. Omar J. Humphreys, from whom the Northwestern Fisheries Co. later on secured it.

The San Juan Fishing & Packing Co., of Seattle, established a cannery and cold-storage plant in 1901 at Taku Harbor, a small bay on the mainland a short distance south of Taku Inlet, and made a pack the same year. This plant was purchased in 1903 by the Pacific Cold Storage Co. and operated by it in 1903, 1904, and 1905. In 1906 it was leased and operated by the Taku-Alaska Packing Co. From 1907 to 1911 the plant was leased and operated by John L. Carlson & Co. In 1911 the plant was purchased by Mr. Carlson and the name changed to the Taku Canning & Cold Storage Co., under which name it has been operated each year since.

In 1901 the Chatham Straits Packing Co. built a cannery on Sitkoh Bay, Chichagof Island. The same year this cannery became a part of the Pacific Packing & Navigation Co. Upon the dissolution of the latter, early in 1905, this plant was purchased by George T. Myers & Co., which company has operated it to date without a break.

In 1901 F. C. Barnes, of Portland, Oreg., built a cannery at Lake Bay, on the east side of Prince of Wales Island, and made a pack that season. This cannery was operated in 1902, but was closed in 1903. It was reopened in 1904, and operated each season after that. In 1910 it was incorporated under the name of F. C. Barnes Co.

In 1901 the Union Packing Co., organized in Tacoma, Wash., built a cannery on Kell Bay, an arm of Affleck Canal, on the southern side of Kuiu Island. In 1904 this plant was moved to the Kvichak River in Bering Sea.

Buhring & Heckman operated a small saltery in Union Bay, on the north side of Cleveland Peninsula, in 1901. Packing was carried on aboard a barge.

In 1901 the Muir Glacier Packing Co. put up a saltery on Ideal Cove, Dry Pass, near Wrangell. It has operated mainly as a mild-cure station. It was closed down in 1903, but open in 1904. It was then closed in 1905, 1906, and 1907. It was opened in 1908 by K. J. Johansen and operated in 1908 and 1909.

In 1902 the Kasaan Bay Co. built a cannery on the north side of Kasaan Bay, Prince of Wales Island, and made a pack the same year. It was shut down in 1904 and 1905, but reopened in 1906 by Gorman & Co., of Seattle, who had purchased control of the company. Shortly after the closing of the packing season the plant burned down, but it was rebuilt in time to operate the following season. In 1909 the plant was closed, but was reopened in 1910. On September 12 of that year the plant was again destroyed by fire, but was rebuilt in time to operate the following season. On October 29, 1911, the plant was once more destroyed by fire, but was rebuilt in time to operate in 1912. In 1915 the plant was purchased and operated by the Anacortes Fisheries Co., a subsidiary of the Booth Fisheries Co.

In 1902 the Alaska Fish & Lumber Co. built a cannery at Shakan, on Kosciusko Island, near the head of Prince of Wales Island, and made a pack the same year. It was shut down in 1904. In 1905 the property was taken over by the Shakan Salmon Co., a new company composed largely of members of the old corporation, who operated it that season. In 1906 Gorman & Co., of Seattle, obtained control of this cannery and operated it each season under the name of the Shakan Salmon Co. until 1915, when it was sold to the Anacortes Fisheries Co., a subsidiary of the Booth Fisheries Co.

In 1902 the Columbia Canning Co. built a cannery on the southern side of Chilkoot Inlet, and made a pack that year. In 1910 C. A. Burckhardt & Co., under the name of the Chilkoot Fisheries Co., purchased and operated this plant. In 1911 the name was changed to that of the Alaska Pacific Fisheries.

The only cannery in this section lost to Alaska by action of the Federal Government was that of the Wales Island Packing Co., which was built on Wales Island, near Dixon Entrance, in 1902. As a result of the action of the Alaska Boundary Arbitration Commission in declaring Wales Island a part of Canada in 1903, this cannery automatically ceased to be an American one. After the change of government it lay idle for some time, but is now in use once more by Canadian parties.

In 1902 the Thlinket Packing Co. built a cannery on Funter Bay, on the west side of Admiralty Island, and made a pack that year and every subsequent year to date.

The same year the Pillar Bay Packing Co. built and operated a cannery near Point Ellis, on Kuiu Island, and has operated it each season to date.

In 1902 the Alaska Fisheries Union, organized in Seattle, built a cannery on the east side of Chilkat Inlet, and made a pack that year. After operating to 1905, the plant was in that year leased to and operated by the Lynn Canal Packing Co. The plant was purchased in 1906 by the Pacific American Fisheries. In 1908 it was moved to Excursion Inlet and has been operated each season to date.

The Tacoma Fishing Co. in 1902 established a saltery and halibut station at Tee Harbor, on Lynn Canal, and made a pack that year. Later it became the property of the International Fisheries Co. In 1910 the plant was purchased by the Tee Harbor Packing Co., which established a cannery and operated first in 1911. It has been operated each season since.

The Seattle-Scandinavian Fish Co. built a saltery on Snug Harbor, Tenakee Inlet, Chicagof Island, in 1902, and made a pack. It packed in 1903 also, but shut down in 1904. The plant was leased in 1905, and then shut down for good.

The Alaska Fish & Mining Co. built and operated a saltery at Revilla, on Tongass Narrows, during the single season of 1902, while the Rice Fisheries Co., in the same year, built and operated a saltery on Boca de Quadra.

The United Fish Co., of Seattle, salted at Tolstoi Bay, east side of Prince of Wales Island, 1903 and 1904.

In 1907 the Alsek Fisheries Co. did some salting on the Alsek River. Malcolm Campbell was interested in the above company and in subsequent years operated under his own name. In 1910 the St. Elias

Packing Co. established a cannery near the saltery and made a pack the same year, and in 1911 and 1912. Since then the plant has been closed and was sold in 1916 to Libby, McNeill & Libby.

The Astoria & Puget Sound Packing Co., in 1908, built and operated a cannery on Excursion Inlet. It was closed the following year, but has been operated each year since.

The year 1911 witnessed a considerable increase in the number of canneries. Among the new plants built and operated were the following: Hidden Inlet Canning Co., Hidden Inlet, Portland Canal; Hawk Fish Co. (later changed to P. E. Harris & Co.); Hawk Inlet, Admiralty Island; Lindenberger Packing Co., Roe Point, Behm Canal; Deep Sea Salmon Co., Cape Edwards, Chichagof Island; L. Gustave & Co., Skowl Arm, Prince of Wales Island (changed in 1912 to Skowl Arm Packing Co.), and M. E. Lane (a small hand-pack plant), Myers Chuck, Cleveland Peninsula.

An innovation in Alaska salmon canning this year was when the old ship *Glory of the Seas* was fitted out as a floating cannery by the Alaska Fish Co., and operated in Hawk Inlet, Admiralty Island, and at Ketchikan. Quarters for the crew were built over the cabins on the quarter deck, the latter being reserved for officials. The remainder of the upper deck was used for receiving, dressing, and cleaning the fish, which were brought on board by means of a portable elevator attached to the side of the ship. The "iron chink" and the sliming and cleaning tanks were also on this deck. The fish were carried in chutes to the second deck, where a line of sanitary machinery had been installed. The retorts were placed on the forward part of the second deck. The third deck was used for cooling and storing the pack. No lacquering or labeling was carried on aboard the vessel.

In 1912 this plant and the ship *William H. Smith*, the latter by the Weiding & Independent Fisheries Co., of Seattle, were operated. The *William H. Smith* also did some freezing of salmon.

In 1913 the *Glory of the Seas* was sold to the Glacier Fisheries Co., which operated it as a cold-storage plant. The floating cannery and cold-storage ship *William H. Smith* was not operated in Alaska during this season.

In 1912 still more canneries were built, among these being the following: Admiralty Trading Co., Gambier Bay, Admiralty Island; Alaska Sanitary Packing Co., Wrangell; Canoe Pass Packing Co., Canoe Pass; Herbert Hume Packing Co., Nakat Inlet, Portland Canal; Hoonah Packing Co., Hoonah, Icy Straits; Irving Packing Co., Karheen; Kake Packing Co., Kake; Kuiu Island Packing Co., Point Beauclaire, Kuiu Island; Lindenberger Packing Co., Craig, Fish Egg Island; Oceanic Packing Co., Waterfall; Point Warde Packing Co., Point Warde, Bradfield Canal; Pure Food Fish Co., Ketchikan;

Revilla Fish Products Co., Ketchikan; Sanborn-Cram Co., Burnett Inlet; Starr-Collinson Packing Co., Moira Sound; Sunny Point Packing Co., Cholmondeley Sound; Swift, Arthur & Co., Heceta Island; Walsh-Moore Canning Co., Ward Cove, and Wiese Packing Co., Rose Inlet.

In 1913 the plant of Swift, Arthur & Co. was used as a mild-cure station alone, while the name was changed to the Swift-Arthur-Crosby Co. The Alaska Fish Co. absorbed the Oceanic Packing Co. and transferred its activities to the former company's cannery at Waterfall. The following other plants were shut down: Canoe Pass Packing Co., Herbert Hume Packing Co., Point Warde Packing Co., and the Revilla Fish Products Co.

In 1914 one new cannery was built. This was erected on George Inlet, Revillagigedo Island, by the George Inlet Packing Co. The canneries of the Point Warde Packing Co., located at Point Warde, and the G. W. Hume Packing Co. (formerly the Herbert Hume Packing Co.), at Nakat Inlet, which were not operated in 1913, were reopened in 1914. The cannery of the Swift-Arthur-Crosby Co. was also reopened. The Walsh-Moore Canning Co. changed its name to the Ward Cove Packing Co., while the Sanborn-Cutting Co. took over the cannery operated by the Kake Packing Co. The canneries of the Admiralty Trading Co. and the Skowl Arm Packing Co. were closed in 1914. The plant of the Kuiu Island Packing Co. burned down in the fall.

In 1915 the Admiralty Trading Co. did not operate. Late in the summer it was sold to the Hoonah Packing Co., which company expects to operate it in 1916. The new canneries this year were the Doyhof Fish Products Co., at Doyhof, on Wrangell Narrows, and Edward Verney & Son (a hand plant), at Metlakahtla. The name of the Irving Packing Co. was changed to the Karheen Packing Co. The Straits Packing Co. purchased the Skowl Arm cannery of the Skowl Arm Packing Co. and operated it.

At one time salteries were of considerable importance in this section, but the establishment of canneries, with the consequent heavy demand for fresh salmon, induced most of the salteries to sell their high-grade fish to the canneries and pack only the cheaper grades. Many of them quit the business as a result of the competition, while others were forced out by the low prices prevailing at times for salted salmon. As many of the salters moved from place to place, and frequently changed their operating name, it has been difficult to keep track of them, and in this review only those are listed who attained to some prominence either through longevity or largeness of pack.

James Millar, one of the earliest whites to take up his residence here after the purchase of Alaska, and his sons were very active in starting and operating salteries, and it was an unusual thing during the period previous to 1910 when one of the family was not operating such a plant.

Jacob Louth established a saltery on the south arm of Moira Sound about 1900 and operated it for some years.

John C. Frey established a saltery on Etoline Island in the nineties and ran it until his death in 1904, when John H. Mantle purchased and operated it until about 1910.

Anderson & King built a saltery on Cholmondeley Sound, Prince of Wales Island, in the nineties. In 1904 it was operated under the name of A. E. King. After Mr. King's death his widow operated it from 1906 to 1909. In 1910 the saltery was purchased by C. A. Burckhardt & Co., who built a cannery on the site and began operations in 1911. In 1912 the name was changed to the Alaska Pacific Fisheries.

The Alaska Fish & Development Co. built a saltery on Pleasant Bay, Admiralty Island, in 1903, and operated it from 1903 to 1905. In 1907 it was operated by the Alaska-American Fish Co., but has been closed since.

Yakutat Bay is the only harbor available for vessels from Cape Spencer to Prince William Sound. In 1902 C. A. Fredericks & Co., of Seattle, Mulvey & Wilson, of Yakutat, Jewell Fish Co., and Ankow Fish Co. all established salteries here. While their primary purpose was the salting of herring, considerable salmon was also salted. These plants operated only the one season.

In 1904 the Yakutat & Southern Railway Co. built a cannery here. This plant is noted for being the only one that hauls its fish by railway from the fishing streams to the cannery. The railroad is a little over 9 miles in length, and for some years an engine which had seen service on the elevated railroads of New York City and was discarded when the latter were electrified was used. A more modern engine is now in use. The fish are carried in open freight cars. Later this company was purchased by Gorman & Co., and now is the property of Libby, McNeill & Libby, although operated under the original name.

#### PRINCE WILLIAM SOUND AND COPPER RIVER.

The great indentation known as Prince William Sound, and the Copper River delta, a short distance south of the sound, have not been exploited as much as many other portions of Alaska, due largely to the limited means of transportation and the consequent heavy expense of operation.

The principal source of salmon supply is the Copper River, which has its source far back in the interior and discharges through its numerous mouths an immense quantity of water.

Owing to the constantly shifting shoals in the delta, special knowledge is needed in navigating them, while special flat-bottomed vessels are required as run boats. The gill net is the only important apparatus in use.

In 1889 a company known as the Central Alaska Co. built a cannery on Wingham, or Little Kayak Island, about 15 miles west from Cape Suckling. It made a pack that year, and the following spring was moved to Thin Point, on the southern side of the Alaska Peninsula.

The Peninsula Trading & Fishing Co. built a cannery on the same island in 1889. In 1891 it was moved to one of the sloughs of the Copper River delta, known as Coquenhena, and operated in 1891. It was closed in 1892 and 1893. The Pacific Steam Whaling Co. operated it until 1897, when it was abandoned.

In 1916 the Hoonah Packing Co. built and operated a cannery near the mouth of Bering River.

Louis Sloss & Co., of San Francisco, built a cannery under the title of Pacific Packing Co. in 1889 at the extreme eastern end of the sound, close by the present site of Cordova, and called it Odiak. The cannery was closed in 1892. In 1893 it joined the Alaska Packers Association and was operated each season until 1905. In 1906 the buildings and site were sold to the Copper River & Northwestern Railroad Co., which was preparing to build a railroad from Odiak to the headwaters of the Copper River.

In 1889 the Pacific Steam Whaling Co. built a cannery close by the Odiak plant, but in the spring of 1895 it was moved to the spot now known as Orca, about 3 miles north of Cordova. Except in 1892, it has been operated ever since. In 1901 it was taken into the Pacific Packing & Navigation Co. combination. When the latter's assets were sold in 1904, this cannery was not included in the sale, as at the time the plant was under lease to Capt. Omar J. Humphrey. In 1905 it was sold to the Northwestern Fisheries Co., which had purchased most of the Alaska plants of the defunct company, and they have operated it since.

In 1915 the Copper River Packing Co. built a cannery on the Copper River at Mile 55, and made a pack the same year. The cannery uses no run boats, but has an arrangement with the Copper River & Northwestern Railroad Co. to haul the fish from the fishing stations to the cannery, and bring the finished product to Cordova for shipment by steamer.

The Canoe Pass Packing Co., which had built a cannery at Canoe Pass, southeast Alaska, in 1912, and had not operated it subsequently, in 1915 moved the machinery to Cordova and installed it in a rented building and made a pack.

This year (1916) the Carlisle Packing Co. built a cannery at Cordova, while the Clark-Graham Co. built one at Eyak, a few miles away.



## COOK INLET.

While this great inlet has an abundant supply of salmon, it is one of the most difficult sections in all Alaska in which to fish successfully. The tides and currents in the inlet are strong and treacherous, increasing in height and force as its head is approached, where the tide comes in with a bore which is extremely dangerous to small craft. Shoals make out a long distance from shore and are continually changing.

The first cannery to be built on the inlet was in 1882, when the Alaska Packing Co., of San Francisco, built one at Kasilof, on the right bank of the Kasilof River at the mouth, utilizing the available machinery from the cannery built by the Cutting Packing Co. at old Sitka in 1878. In 1885 this cannery was sold to the Arctic Fishing Co. In 1890 the loss of its cannery ship forced it to close that season. In 1893 it joined the Alaska Packers Association. At the height of the season of 1905 the plant was burned. It was rebuilt the next spring and has been operated each year since.

The cannery of the Northern Packing Co. was built in 1888 on the eastern side of Cook Inlet, at Kenai, at the mouth of the Kaknu River. It was operated up to and including 1891. In 1893 it joined the Alaska Packers Association, but has not been operated since 1891.

In 1897 the Pacific Steam Whaling Co. built a cannery at Kenai, but did not install the machinery and operate it until the next year. In 1901 this cannery was taken over by the Pacific Packing & Navigation Co. In 1903 the plant burned down. Upon the sale of its assets in 1905 the site passed to the Northwestern Fisheries Co. In 1910 the company put up a new plant here and has operated it continuously since. During the period when the site was unused a mild-curing establishment was operated here by the San Juan Fishing & Packing Co. in 1907 and 1908. This plant was burned down just before the fishing season of 1916 began.

In 1890 George W. Hume, of San Francisco, built a cannery at Kasilof, on the right bank of the river, about half a mile above its mouth. It was operated in 1890, 1891, and 1892. In 1893 it joined the Alaska Packers Association and was consolidated with the plant of the Arctic Fishing Co.

C. D. Ladd operated a saltery on the left bank and at the mouth of the Chulitna River, about 6 miles above Tyonek. This saltery was purchased by the Alaska Salmon Association in 1899. The following spring it erected a cannery here and made a small pack. It was operated also in 1901 and 1902, and then abandoned.

In 1907 J. A. Herbert & Co. established a saltery at English Bay and operated it until 1910.

In 1911 the Seldovia Salmon Co. built a cannery at Seldovia and operated it continuously to date. Late in 1915 the company went into the hands of a receiver. In 1916 it was reopened by the Columbia Salmon Co.

In 1912 the Fidalgo Island Packing Co., which already operated a cannery at Ketchikan, in southeast Alaska, built a cannery at Port Graham, at the lower end of the Kenai Peninsula. A pack was made that year and each year since.

The same year Libby, McNeill & Libby built a cannery at Kenai and operated that year and each subsequent year.

In 1915 the Deep Sea Salmon Co., which operates a cannery in southeast Alaska, built a plant near Knik, on the west side of Cook Inlet, and made a small pack.

#### AFOGNAK ISLAND.

Afognak Island lies to the northwest of Kodiak, and it is separated from it by a narrow strait.

In 1889 the Royal Packing Co. built a cannery at the head of Afognak Bay and operated it in 1889 and 1890. It became a member of the Alaska Packers Association in 1893. It has not been operated since 1892.

The Russian-American Packing Co. in 1889 built a cannery immediately above that of the Royal. It was operated in 1889 and 1890. In 1893 it became a member of the Alaska Packers Association. It has not been operated since 1890.

In accordance with an act of Congress approved March 3, 1891, the President, by proclamation of December 24, 1892, set aside the whole island and within 1 mile from the shores thereof as a fish-cultural reserve for the use of the United States Commission of Fish and Fisheries. As a result of this action both canneries were forced to move from the island entirely.

#### KODIAK ISLAND.

This island has been the scene of some of the best fishing in Alaska. The Russians early settled here, one of the most fertile spots in the usually sterile soil of Alaska, and undoubtedly they must have prosecuted the fisheries from an early date, although but little data are extant showing their operations in this line.

*Karluk River and Lagoon.*—One of the greatest salmon streams in the world is the Karluk River, and although extensive fishing operations have been carried on for many years, it still produces, annually, a large pack of canned salmon, and has the distinction of having produced more salmon than any other river in Alaska. An exceptionally heavy run occurred in 1916.

It will doubtless surprise most readers when it is stated that the river which has yielded so many countless thousands of salmon is only  $16\frac{1}{2}$  miles in length. The river has its source in two lakes; the larger of these is about 8 miles long and the smaller 3 miles long. The mouth of the river is about 2 miles above the canneries, and spreads out here into a lagoon. This lagoon has at the head a width of about 300 yards, and gradually widens until it is nearly half a mile across as it approaches the spit. The lagoon has a general east and west direction, is about 2 miles in length, and, except for the shingle spit which is thrown across its mouth by the action of the sea, its shores are bluff, rising from about 50 to 100 feet. The spit is three-fourths of a mile long with an average width of about 200 feet. The outlet of the lagoon is only 90 feet wide at its mouth. The western side of the mouth of the lagoon is Karluk Head, a precipitous mountain mass about 1,600 feet high.

The outer side of the spit is where the fishing is carried on. Haul seines are used exclusively. As bowlders used to be common here it was necessary to remove a number of them in the early days when a seine shore was to be prepared. The red salmon run here is an exceptionally long one, the season extending from about the middle of June to about the middle of September. The other species of salmon also run here; sometimes humpbacks appear in large numbers. As the beach is open to Shelikof Strait, in which storms are frequent, seining is often interrupted.

As early as 1867 the salting of salmon was carried on at Karluk. In 1870 the Alaska Fur Trading Co. and the Alaska Commercial Co. began to salt salmon and continued this on a gradually expanding scale.

In 1882 Smith & Hirsch, who had been engaged in salting on Karluk Spit, built the first cannery on Kodiak Island. After operating it until 1884 it was organized under the title of the Karluk Packing Co., and packed under that name every year until 1911, when canning operations were transferred to the new cannery in Larsen Bay. In 1893 it joined the Alaska Packers Association.

The Kodiak Packing Co. in 1888 built a cannery on the eastern side of the spit and operated it in 1888, 1889, 1890, 1891, and 1893. It joined the Alaska Packers Association in 1893, but has not been operated since that season.

The Hume Packing Co. built a cannery on the spit about 400 yards westward of Kodiak cannery in 1889. In 1892 it was consolidated with the Aleutian Islands Fishing & Mining Co., which had built a cannery about 100 yards westward of the Hume cannery in 1888. In 1893 the consolidation became a member of the Alaska Packers Association. This plant was not operated in 1900.

In 1888 the Alaska Improvement Co. built a cannery on the left bank of the outlet, opposite the point of the spit and facing the Shelikof Strait. It was ready to pack in 1888, but was not operated on account of the loss of its cannery ship, the *Julia Ford*. In the spring of 1897 it was sold to the Alaska Packers Association and has since been operated by that company.

In 1893 the Hume Canning & Trading Co. built a cannery on the beach under Karluk Head, about three-fourths of a mile northward of the Alaska Improvement Co., in what is known locally as Tanglefoot Bay. It was operated in 1893 and 1894, and in 1895 it was sold to the Alaska Packers Association and operated by that company. It has been closed since.

The great increase in the number of canneries in Alaska in 1888 and 1889 caused such an enlargement of the pack that the markets became glutted, and it was soon apparent that steps would have to be taken to reduce the output if the operators were to avoid bankruptcy.

Capt. Moser in "Salmon and salmon fisheries of Alaska"<sup>a</sup> thus describes the attempts of the canners to find a working solution of this important problem and the final result of their endeavors:

In 1890 the three canneries at Chignik combined under an operating agreement known as the Chignik Bay Combination, under which the plant of the Chignik Bay Co. was operated, the three canneries sharing the expense and dividing the output equally. This arrangement remained in force during the seasons of 1890 and 1891. Its evident success in 1890 probably led to the local combinations on Kodiak Island in 1891, and then to the association which now exists.

The large packs during this period and the glutted market caused the cannery interests to devise some scheme to meet the conditions. The combination at Chignik in 1890 permitted the pack to be made there at a lower rate and, as previously stated, it was continued in 1891. The same year (1891) the canneries at Karluk, Uyak, and Afognak entered a combination, under the name of the Karluk River Fisheries, under which it was agreed that each cannery should have a quota of fish from the several localities, based upon the average packs of each cannery in 1889 and 1890. The estimated pack for the canneries interested was placed at 250,000 cases, and upon this estimate the apportionment of the work at each cannery was made. Under this agreement four of the eight canneries were closed, their quota being packed in the other four canneries as follows, viz, that of the Royal at the Karluk, of the Arctic at the Kodiak, of the Aleutian Islands at the Hume, and of the Russian-American at the Alaska Improvement.

In the summer of 1891 the Kodiak Packing Co. and the Arctic Packing Co., both at Alitak Bay, also had a mutual agreement under which only one cannery, the Arctic, was operated, the quota of fish of the Kodiak being packed in the Arctic cannery. By these combinations the full pack of the Karluk district was made in half the number of canneries and the expense of packing very considerably reduced.

In September, 1891, the Alaska Packers Association was formed to dispose of the unsold salmon of that season's pack (some 363,000 cases) and five trustees were appointed to manage the business. This association was not incorporated and expired after the salmon were sold.

<sup>a</sup> The salmon and salmon fisheries of Alaska. Report of the operations of the U. S. Fish Commission steamer *Albatross* for the year ended June 30, 1898. Bulletin U. S. Fish Commission, vol. xviii, 1898, d. 18-21.

The successful operation of these arrangements led, in 1892, to an arrangement in which nearly all (31) of the canneries joined, entering under the name of the Alaska Packing (not Packers) Association, for the purpose of leasing and operating and therefore controlling the canneries and reducing the Alaska pack for that year, it being found too great for the market's demands. All the canneries in operating condition in 1892 were members of this association except the following: Metlakatla Industrial Co., at Metlakatla; Boston Fishing and Trading Co., at Yes Bay; Baranoff Packing Co., at Redfish Bay; Chilkat Canning Co., at Pyramid Harbor; Alaska Improvement Co., at Karluk; and the Bering Sea Packing Co., at Ugashik.

The association was regularly incorporated on January 13, 1892, and shares were distributed on the basis of 1 for each 2,000 cases packed in 1891, and the profits were divided equally on all shares regardless of the amount of profits derived at the different points. Of the 31 canneries, 9 were operated by the association, while the others were closed, the Alaska pack being reduced one-half.

The year 1893 found the Alaska Packers Association organized and incorporated February 9. This association was formed from the canneries that had joined the Alaska Packing Association of 1892, except the Pacific Steam Whaling Co., at Prince William Sound, and the Peninsula Trading and Fishing Co., the latter's cannery having been moved from Little Kayak Island to the Copper River delta in 1891.

The agreement of 1893 was similar to that of 1892, except that the amount of profit was taken into consideration in addition to the probable average quantity which could be packed at the different points. This was subject to adjustment for each district and no arbitrary rule was followed. Each cannery entering the association was obliged to purchase an additional amount of stock, equaling two-thirds of the number of shares received by it for its plant; that is, a company which received 1,500 shares for its plant was required to purchase 1,000 shares additional. The money received from this sale of extra stock was used as working capital. No shares were sold to the general public, the owners of canneries subscribing for the full amount.

This association was then and is now (1916) the largest operator in Alaska, and, with its three canneries on Puget Sound, is also a factor in that region.

At a number of its canneries the association has always maintained physicians, whose services and supplies have been free to its own employees and to all natives applying for medical advice and medicines. This service has been of incalculable benefit to the latter, a large proportion of whom suffer from disease in some form or other.

*Alitak Bay.*—Alitak Bay, or the "South End," as it is termed locally, is a deep indentation, with several arms, on the southwestern end of Kodiak Island, about 65 miles from Karluk. The seine is the principal apparatus used here.

In 1889 the Arctic Packing Co. built a cannery in the southwest bight of Olga Bay, which is a branch of Alitak Bay and is connected with it by a long, narrow passage. In 1893 it entered the Alaska Packers Association.

In 1889 the Kodiak Packing Co. built a cannery at Snug Harbor, a cove in the passage connecting Olga Bay with Alitak Bay, and operated it in 1889 and 1890. Its quota of fish was packed by the Arctic Packing Co. in 1891. In 1893 it joined the Alaska Packers Association and the same year was dismantled.

*Uyak Bay.*—Uyak Bay is on the northwestern side about the middle of Kodiak Island and is a considerable body of water with ramifying arms. On the western shore, near the entrance and about 18 miles from Karluk, is Uyak Anchorage. The harbor is formed by the main shore of the island and Bear and Harvester Islands, and is frequently used as an anchorage by cannery ships and the steamers from Karluk during bad weather. As there are no red salmon streams in Uyak, fishing is carried on elsewhere. Most of it is at Karluk Spit.

In the spring of 1897 the Pacific Steam Whaling Co. and Hume Bros. & Hume built canneries on the main shores at Uyak Anchorage. In 1901 both plants became a part of the Pacific Packing & Navigation Co. and were operated by it. In 1905 the Uyak plants were purchased by the Northwestern Fisheries Co., and the same year one of the plants was destroyed by fire and was not rebuilt. The remaining plant has been operated each year since.

Five miles southeast from Uyak Anchorage is a narrow arm called Larsen Bay. It is 4 miles long. Immediately within the entrance on the northern shore is the site of the cannery of the Arctic Packing Co., which was built in 1888, and operated in that year and 1889 and 1890, since which date it has been closed. In 1893 it became a part of the Alaska Packers Association and in 1896 it was dismantled.

As the association had lost several ships while loading at Karluk, it finally decided to move its plants from that place, and in 1911 a cannery was built at the old site on Larsen Bay and from that time all cannery operations formerly carried on at Karluk have been performed at this plant.

*Uganuk Bay.*—This bay is next to the eastward of Uyak. For several years a saltery was operated here by Oliver Smith, who sold it to the Alaska Packers Association in 1896. The same year the latter built a cannery on the bay. It made a pack in 1896 and a partial pack in 1897. This cannery was abandoned in 1900.

*Kodiak.*—Salting operations have been carried on at this old Russian settlement for a number of years.

In order to furnish work for the natives, the Alaska Commercial Co. and Blodgett & Blinn salted the catches made by them in 1906 and subsequent years until 1912, when the Kodiak Fisheries built a cannery and has operated it each year since.

The Woman's American Baptist Home Missionary Society had carried on a home and school for native children on Wood Island, close to Kodiak, for some years. In 1902 the society established a salmon saltery here in order to furnish employment for the natives. No data are recorded in the official reports of further activities on the part of this plant.

## CHIGNIK BAY.

Chignik Bay is on the southern side of the Alaska Peninsula and is the first important indentation after leaving Cook Inlet on the way to the westward. The bay is about 150 miles southwest of Karluk. On the westward side of the bay is a small deep bay known as Anchorage Bay. Several of the canneries are located here and the transporting vessels of all the canneries make their anchorage at this point. In the extreme southwest corner of Chignik Bay is the entrance to Chignik Lagoon. At the head of this lagoon, from which all the canneries draw their supplies of red salmon, is the mouth of the stream up which go the schools.

Chignik River is about 6 miles long, with an average width of 100 yards. The depth in the river is such that a boat can ascend only at high water. The river has its rise in two lakes, each about 10 miles long.

Red salmon predominate in the runs, although all five species are to be found. A run of very small red salmon, weighing about 2 pounds, and known as Arctic salmon, appears here every year.

Practically all of the fishing here is with traps, although gill nets and seines have also been used at times.

This bay, next to Karluk Spit, has been the scene of more bitter fights for supremacy in canning than any other place in Alaska.

In 1888 the Fishermen's Packing Co., of Astoria, Oreg., sent a party to Chignik Bay to prospect for fish, and they returned in the fall with 2,160 barrels of salt salmon.

The next year, this company, operating under the name of the Chignik Bay Co., built a cannery on the eastern shore of the Lagoon,  $2\frac{1}{2}$  miles from the entrance.

The same year the Shumagin Packing Co., composed of capitalists from Portland, Oreg., and the Chignik Bay Packing Co., of San Francisco, built and operated canneries close to that of the Chignik Bay Co. All three of these companies soon arrived at a working agreement and finally combined into one organization. All were operated in 1889, 1890, and 1891. In 1892 they all joined the pool of the Alaska Packing Association, and the cannery of the Chignik Bay Co. alone operated. In 1893 they all became members of the Alaska Packers Association.

Since 1891 only the cannery of the Chignik Bay Co. has been operated. The Shumagin building has been moved alongside the former and the machinery consolidated, so as to form practically one large cannery.

In the spring of 1896 Hume Bros. & Hume built a cannery on the eastern side of Anchorage Bay and made a pack that year and in 1897.

The same spring the Pacific Steam Whaling Co., built a cannery one-fourth of a mile south of the Hume cannery, and made a pack that year and in 1897. In 1901 this plant, also that of Hume Bros. & Hume, became part of the Pacific Packing & Navigation Co. The failure of this company in 1904 threw its properties onto the market and most of them, including the two Chignik canneries, were purchased by the Northwestern Fisheries Co., which in 1905 shut down the Hume Bros. & Hume plant for good and has operated the other plant ever since.

In 1910 the Columbia River Packers Association built and operated a cannery on Anchorage Bay, and has operated it every year since.

#### ALASKA PENINSULA.

Of recent years canneries have been located on the Bering Sea side of the Alaska Peninsula, outside of Bristol Bay proper, but it is probable that their numbers will not be large in the future as the fisheries tributary to them are not very extensive, and are also very much scattered, making transportation expensive.

*Port Heiden.*—This important indentation on the Bering Sea side of the Alaska Peninsula, about midway between the Ugashik River and Port Moller, has never figured to any considerable extent in fishing operations. In 1912 and 1913 Gorman & Co. had the schooner *Harriet G.* located here throughout the season, engaged in salting salmon.

*Port Moller.*—This great indentation in the Alaska Peninsula, between Port Heiden and Nelson Lagoon, was neglected for many years for the more profitable Bristol Bay region.

About 1902 the Bering Sea Packing & Trading Co. (there seems to be some confusion between this name and that of the Peninsular Packing Co., the latter being the name the company was known by after the first year or two in the official records), established a saltery on Bear River, a tributary of Port Moller, and operated it until 1906, after which operations were suspended and but little is now left of the plant.

In 1912 the Pacific American Fisheries erected a cannery on Port Moller, but it was not operated until 1913. This concern has been successful mainly because of its introduction of purse seines in fishing operations.

*Nelson Lagoon.*—Nelson Lagoon is on the Bering Sea side of the Alaska Peninsula, is about 6 miles in length and about 2 miles in width. At its western end debouches the Nelson River, which is about a mile wide at its mouth. About 18 miles from the mouth the river divides, both branches having their rise in lakes. There is an easy portage from the lakes to Pavlof Bay, on the Pacific side of the peninsula, and this route is used frequently by both white men and Indians.



The run is mainly of red salmon, and gill nets and traps are utilized. During the last few years purse seines have been used in this region with considerable success.

In 1902 Charles Johnson, who had operated on the Ugashik River, established a saltery here and operated it under the name of the Lagoon Salmon Co., and made a pack that and the succeeding year. In 1904 and 1905 it was shut down. It was reopened in 1906 and continued to operate until it was sold in 1914, and in 1915 the new owners, the Nelson Lagoon Packing Co., built and operated a cannery here.

*Unalaska Island.*—This year (1916) the Pacific American Fisheries, having obtained a permit from the Department of Commerce, built a cannery at Unalaska, on Unalaska Island. This cannery is located inside of the Aleutian Islands reserve, and permit was given for its building and operation so that it might be possible for the Indians of Unalaska and Dutch Harbor to obtain work at home and save them the long trip to the Bristol Bay plants.

*Ozernoy.*—In 1889 a cannery, under the title of the Western Alaska Packing Co., was built at Ozernoy, on the western side of Stepovak Bay, south side of the Alaska Peninsula. It packed that year and in 1890, but the fish were so scarce that the cannery was dismantled in 1891 and the site abandoned.

Nothing was done with it for some years, but about 1905 Bostrop Omundsen located there and established a saltery. In the winter of 1912-13 August Lindquist purchased a half interest in the plant and it was operated under their joint names until the death of the senior partner in the fall of 1915; since then it has been operated by the former alone.

*Thin Point.*—Thin Point is on the southern side of the Alaska Peninsula, near its extreme western end. A saltery was operated here for several years, until the Thin Point Packing Co. was organized by Louis Sloss & Co., of San Francisco, and the cannery was built in 1889. It was operated in 1889, 1890, and 1891, and was closed after that date. In 1890 the cannery ship *Oneida*, en route for this place, struck on the Sannaks in April and nearly all of the 77 Chinese on board were lost. In 1893 the plant became a member of the Alaska Packers Association. In 1894 the cannery was moved to the Naknek River, in Bering Sea, and became a part of the cannery of the Arctic Packing Co.

The Alaska Packers Association operated a saltery at Thin Point in 1894, 1895, and 1896, and then abandoned the place.

The cannery of the Central Alaska Co. was moved in 1890 from Little Kayak Island, near Katalla, to Thin Point. It operated during 1890 and 1891, was closed in 1892, and in 1893 joined the Alaska Packers Association, but was no longer operated. In 1895 the available machinery was moved to Koggiung on the Kvichak River, in Bering Sea.

In 1908 Osmund & Andersen established a saltery at Thin Point and operated it in 1908, 1909, and 1910.

In 1911 the Pacific American Fisheries built a cannery at King Cove, on the south side of the Alaska Peninsula, a few miles east of Thin Point, and in the fall purchased the saltery. The cannery was operated in 1911 and each year since.

#### SHUMAGIN AND SANNAK ISLANDS.

Small salteries have been operated at different places on the Shumagin and Sannak groups. The plants have usually been rude and primitive affairs and were operated whenever the price of salted salmon was high enough to justify same. As the ownership, and the location in many instances changed frequently, no attempt has been made even to list them.

#### BERING SEA.

The great redfish producing section of the world is in the Bristol Bay section of Bering Sea. This bay lies in the eastern section of Bering Sea, inside of a line drawn from Port Moller to Cape Newenham, and a number of important rivers debouch into it, in all of which the annual runs of salmon, especially reds, are important.

Bristol Bay is considerably off the line of steamship travel, and as a result the companies operating here are compelled to have ships in which to bring up their employees and supplies in the spring and to take back the men and prepared products in the late summer or early fall when the season has ended.

Cannery ships belonging to the Nushagak plants are taken into the bay and anchored as near the canneries as possible. Owing to shoals this can not be done on Kvichak Bay and the Naknek and Ugaguk Rivers. In the early days of the fisheries the ships running to the latter canneries were brought as close to the plants as possible, unloaded by means of scows, and then taken to the Nushagak for shelter. When their numbers were too great to permit of this they were moored in the open about 5 miles off the point separating Kvichak Bay and Naknek River, where the anchorage is good and the vessels have very little trouble in riding out storms. Usually the captain and a boy are left aboard the ship.

#### NUSHAGAK RIVER AND BAY.

The Nushagak River, sometimes called the Tahlekuk, with its tributaries, and the Wood River, which enters the head of Nushagak Bay close by the mouth of the Nushagak, form a favorite resort of the red salmon, while all other species also ascend them.

But little is known of the upper courses of the Nushagak River, except that they drain the region between Lakes Clark and Iliamna on the east and the Kuskokwim on the west.

The river is said to be 200 miles long to the first lake, a large one. Beyond this lake there are three other smaller lakes, all connected by short stretches of river. The largest tributary of the river is the Malchatna, which enters it about 100 miles from the mouth. There are also several small tributaries, two of these being Tikchik River and Portage Creek. There are three or four Indian villages on the Nushagak, Kaknak being the largest. A launch drawing 3 to 3½ feet of water can navigate about 120 miles from the mouth. It is necessary to use a "bidarka" to go into the upper reaches. There are four rapids, around which a portage must be made in each case.

The river on its lower course is large, and flows a great quantity of water into the head of Nushagak Bay.

Wood River is about 24 miles long from its mouth to the first lake. Shoals and bars are frequent in the river, the depth on these at low water being 2½ feet and at high water 4 feet.

Aleknagik Lake, the first of the chain of three, is about 24 miles long, and has an average width of about 2 miles.

Wood River is noted especially for the interesting counting experiment the Bureau of Fisheries is carrying on here. This very important work was first taken up in 1908, as an indirect result of the order closing Wood and Nushagak Rivers to the commercial fishermen, as noted below, and has been continued, with the exception of 1914, to the present time. This work is made possible by the generosity of the Alaska Packers Association of San Francisco and the Alaska-Portland Packers Association of Portland, Oreg., who furnish the material and erect the barricade, also the labor needed throughout the season, while the Bureau of Fisheries furnishes the personnel required to carry on the direct work of counting the fish and making other observations.

A rack or trap is constructed across the foot of Lake Aleknagik, at a constriction in the lake contour something more than 200 yards wide, for the purpose of intercepting all salmon entering the lake and passing them through gates or tunnels at such a rate and in such a manner that an accurate estimate of their numbers can be obtained. The pot of the trap is located near the left bank, and this has three gates by which the salmon can be passed from the pot into the lake. Each gate is 2 feet in width, and its bottom rests on a wooden platform covered with white oilcloth, so that the fish can readily be seen as they pass over it when the gate is raised. When fish are passing through a gate a small wooden frame with a glass center is arranged so it will float on the water, and in order to hold it in position it is fastened to the framework of the gate. This is for the purpose of making the water smooth so the fish can readily be seen even though the surface be disturbed by ripples, etc.

When the fish are coming rather slowly every one is counted by means of a tally register as it passes out through the gates. When the

large run comes the following method is employed: An actual tally of every salmon passing through is made for one minute, and this is repeated 15 minutes later, the number passing through for one minute being regarded as the average for 15 minutes. A sheet with the whole day divided into quarter hours is kept ready at the gate and the number for one minute as taken from the tally register is immediately entered thereon by the attendant who made the tally. From these figures the total for the day is obtained. During only a small part of the season has it been found necessary to resort to this method of estimating the run.

The following table shows for each year since 1908 the commercial catch of salmon made in Nushagak Bay, the number of fish passing from Wood River into Lake Aleknagik, the total of both and the percentage of salmon that escaped the fishermen:

Years.	Nushagak Bay catch.	Wood River tally.	Total.	Per cent of escape.
1908.....	6,140,031	2,600,655	8,740,686	30
1909.....	4,687,635	893,244	5,580,879	16
1910.....	4,384,755	670,104	5,054,859	13.2
1911.....	2,813,637	354,299	3,167,936	11.1
1912.....	3,866,950	325,264	4,192,214	7.7
1913.....	5,236,098	753,109	5,989,117	12.5
1914.....	6,074,432	(a)	.....	.....
1915.....	5,616,457	259,341	5,875,798	.4
1916.....	.....	551,959	.....	.....

a Work not carried on this year.

Snake River, a tributary of Nushagak Bay, is about 30 miles in length, very crooked, and has its rise in a single lake close by Aleknagik Lake. There is an Indian village on the river just below the lake. Red salmon are abundant in this stream.

Igushik River is about 50 miles in length and enters Nushagak Bay about 4 miles above Nichols Hills. So far as known it has its source in two lakes—Amanka and Ualik. A short distance below the first lake there are rapids and a small falls. The quite large Indian village of Yacherk is located here, and the natives do most of their fishing in the rapids. Peter M. Nelson established a saltery about 10 or 12 miles above its mouth in 1902, and operated it until he sold it to the Alaska Fishermen's Packing Co., who have operated it since. There is a small Indian village close by the saltery.

Nushagak Bay, in which practically all the fishing is carried on, is about 35 miles long and from 5 to 15 miles wide. Sand bars and mud flats, which are visible at low water, occupy the greater part of its area.

The drift gill net is the favorite apparatus in this bay, although a few traps are also used. The fish begin to run very early here. Kings usually appear about June 5, reds about June 5 to 8, cohos appear either late in June or early in July, chum salmon about the middle of June, and humpbacks about the same time.

Considerable fishing was carried on in both the Nushagak and Wood Rivers until in 1908, when, as a result of a hearing held by the Secretary of Commerce and Labor on December 16 and 17, 1907, it was decreed that beginning January 1, 1908, "it is hereby ordered that until further notice Wood River, a tributary of Nushagak Bay, in the district of Alaska, and the region within 500 yards of the mouth of said Wood River be closed to all commercial fishing, and that all commercial fishing be prohibited in Nushagak River proper."

The earliest fishing by whites in the Bristol Bay section was for salting purposes by the trading companies, more particularly the Alaska Commercial Co., which had an important station at Fort Alexander on Nushagak Bay. Petroff, in the census report of 1880, refers to exports from this section of "from 800 to 1,200 barrels of salted salmon per annum from the Nushagak River."

In 1883 the schooner *Neptune* visited the Nushagak on a salting trip. The next year the Arctic Packing Co. erected a cannery here and made a trial pack of 400 cases. This was the first cannery to operate in Bering Sea. It was located close to the Moravian mission. This cannery eventually became a member of the Alaska Packers Association, and has not been operated for several years.

The second cannery to be built was by an Astoria company, the Alaska Packing Co., and it was erected on the western side near the head of the bay and about  $1\frac{1}{2}$  miles below the mouth of the Wood River. It has been operated every year to date, being since 1893 a member of the Alaska Packers Association. It is popularly known as the "Scandinavian" cannery.

In 1886 the Bristol Bay Canning Co. was organized by San Francisco parties, and built a cannery on the western shore of Nushagak Bay in a bend about 2 miles below the cannery of the Alaska Packing Co., at a place called Dillingham. It became a member of the Alaska Packers Association in 1893 and was operated each year until 1907. A couple of years later it was dismantled. This plant was popularly known as the "Bradford" cannery.

The Nushagak Canning Co. built a cannery on the eastern shore of Nushagak Bay in 1888, at a place known as Clark Point,  $5\frac{1}{2}$  miles below Fort Alexander. This cannery also became a member of the Alaska Packers Association in 1893, but from 1891 to 1901 was not operated, but held in reserve. In the last named year a large double cannery was built here and put into operation and has been operated each year since.

This company also built and operated a saltery on the Igushik River in 1886. Three years later it was moved to the mouth of the Nushagak. In 1893 C. E. Whitney & Co. purchased an interest in it and by 1899 owned it all. In 1902 the saltery was sold to the Alaska Packers Association, which closed it down.

In 1899 the Pacific Steam Whaling Co. built a cannery and commenced canning on the eastern shore of Nushagak Bay at Fort Alexander, or Nushagak village. This cannery was purchased by the Pacific Packing & Navigation Co. in 1901 and upon the sale of its properties in 1904 became a part of the Northwestern Fisheries Co. It has been operated each year since the latter company acquired it.

The same year the Alaska Fishermen's Packing Co., of Astoria, built a cannery immediately below that of the Pacific Steam Whaling Co., and operated it every year to date, control of the company passing to Libby, McNeill & Libby in 1913.

In 1901 the Columbia River Packers' Association, the Alaska-Portland Packers Association, and the Alaska Salmon Co., all built canneries on the Nushagak and have operated them to date, except the last named in 1909, when its supply ship was wrecked. The Alaska Fishermen's Packing Co. also built a saltery here. The latter plant was abandoned in 1904.

In 1903 the North Alaska Salmon Co. operated a new cannery on the Nushagak, a few miles below Clark Point.

In 1910, on August 10, shortly after the packing season had ended, the plant of the Alaska-Portland Packers Association was completely destroyed by fire. The plant was rebuilt in time to operate the next season.

#### KVICHAK RIVER AND BAY.

The Kvichak River is about 80 miles in length, varies from 100 yards to a mile in width, and discharges a vast quantity of water. The influence of the tide is felt 30 miles from the mouth. The current is very swift, running in places as much as 7 miles an hour. The upper half of the river is filled with low, grassy islands, the channels in many places being quite narrow. A launch drawing 3 feet of water can reach Lake Iliamna with very little difficulty. In most sections there are over 2 fathoms of water in the channels. The river drains Iliamna Lake, the largest lake in Alaska, which is about 90 miles long and about 30 miles wide, and Lake Clark. There are a number of Indian villages along the shores of the river and lakes.

Practically all of the fishing here is carried on in Kvichak Bay, gill nets being the favorite form, with also a couple of traps set in the lower part of the river. As it is not convenient for the fishermen to bring the catch to the canneries, large house lighters and scows are moored in convenient places and the fishermen live aboard the former, while the fish are put aboard the latter and taken to the canneries by the run boats. The numerous shoals in the bay seriously impede both fishing and navigation.

The first fishing operations on the Kvichak were in 1894, when the Prosper Fishing & Trading Co. and the Alaska Packers Association each established a saltery and operated that year and in 1895; in 1896 the latter purchased the plant of the former and consolidated the two.

In 1895 the Point Roberts Packing Co., which was owned by the Alaska Packers Association, built a cannery at Koggiung, the site of the former saltery, and operated it the next year.

In 1900 there was a considerable development in this region. The Kvichak Packing Co., owned by the Alaska Packers Association, built a cannery on the northern point of entrance to Bear Slough, while the North Alaska Salmon Co. built two canneries about 1,000 feet apart on the left bank of the Kvichak, about 6 miles above Koggiung.

The latter company built a cannery at Hallerville on the Alagnak River, a tributary of the Kvichak, in 1904. In 1913 a large new cannery to take the place of the Hallerville plant was built on the lower side of Pedersen Point, lower down on Kvichak Bay.

The second plant of the Alaska Packers Association, known as the Coffee Creek plant, was burned down in 1906. It was rebuilt in 1908 and operated again in 1909, and has been operated continuously ever since.

In 1904 the Union Packing Co. established a cannery on the left bank a little distance above the canneries of the North Alaska Salmon Co., having moved this plant from its original location on Kell Bay, in southeast Alaska. It was operated until 1907, when it was abandoned.

About 1905 the Northwestern Packing Co. built a saltery on the east side of the bay. In 1908 it was sold to and operated by Nelson, Olsen & Co., who in 1910 sold it to the Alaska Fishermen's Packing Co., which the following year turned it into a cannery. In 1913 Libby, McNeill & Libby bought this and the Nushagak plant, and continued to operate them under the old name.

#### NAKNEK RIVER.

But little is known of the Naknek River for more than 10 or 15 miles from its mouth. It is said that the river is about 60 miles long, and has its rise in a lake which is of considerable size. With the exception of a short series of rapids, up which it is possible to haul a boat with a rope from the shore, the river is navigable for small craft. Shoals and banks, many of which uncover at low water, are abundant in the lower course of the river.

Red salmon is the principal species entering this river, although all the other species are to be found here in lesser abundance. They

appear here a little later than in the Nushagak Bay. Only gill nets are used in fishing.

The first commercial fishing on the Naknek River was in 1890, when the Arctic Packing Co. built and operated a saltery on the east bank about 4 miles from the mouth. This plant was sold to the Alaska Packers Association in 1893, and the next year the latter built a cannery here, and made the first pack in 1895, and has operated it every year since. Ultimately the saltery was merged with the cannery.

In 1901 the association built another cannery about a mile nearer the mouth, and in 1911 still another was built close to the mouth.

In 1890 L. A. Pedersen built and operated a small saltery on the right bank about 3 miles from the mouth. In 1894 the Naknek Packing Co. purchased the saltery and erected a cannery a short distance above. This saltery and another built on the shore of Kvichak Bay in 1897 were operated for some years. In 1907 the latter was turned into a cannery and operated by Mr. Pedersen under the name of the Bristol Bay Packing Co. The Naknek Packing Co. cannery has been operated to date.

In 1916 the Red Salmon Canning Co. built and operated a cannery between the plants of the Naknek Packing Co. and the Bristol Bay Packing Co.

#### UGAGUK RIVER.

According to the natives this river, which is frequently called the Egegak, or Igagik, is about 80 miles long from the mouth to Lake Becharof, at the head. The lake itself is about 45 miles long and 15 miles wide. The river is navigable for small boats to within 10 miles of the lake, whence there is a succession of rapids, around which it is necessary to portage. The lower part of the river has numerous shoals, some of which are exposed at low water. King Salmon River, the principal tributary, enters about  $7\frac{1}{2}$  miles from the mouth.

The red salmon is the principal species, although all the other species are found in much lesser abundance. Gill nets alone are used here.

In 1895 the Alaska Packers Association established a fishing station on the right bank about 5 miles from the mouth and operated as a saltery until 1900, when the apparatus was moved to the cannery site.

In 1899 the Alaska Packers Association, under the name of the Egegak Packing Co., commenced building a cannery on the left bank opposite and a little above the salting station. This plant was finished in 1900 and packs were made that year and each succeeding year except 1905 and 1906.

In 1903 the North Alaska Salmon Co. built and operated a cannery on the opposite shore from the Alaska Packers Association, and has operated it each year to date.



## UGASHIK RIVER.

This river has its rise in a chain of two lakes, but with the exception of that portion below the upper cannery, about 25 miles, it is very little known to the whites. The river is very tortuous in its course. It has two known tributaries—King Salmon River, which enters through the left bank about 17 miles from the bar at the mouth, and Dog Salmon River, which enters through the left bank about 37 miles from the bar. From Smoky Point to the capes at the mouth the river widens very greatly, being about 20 miles across at the mouth. Shoals are numerous, but there is a channel with about 9 feet at low water.

This river is essentially a red salmon stream, but the other species are also taken in small numbers, although the humpback is very scarce. This river is noted for the great falling off in the run of red salmon of recent years, 769,002 red salmon being taken in 1901, 1,640,973 in 1902, 1,703,536 in 1903, 564,492 in 1904, 432,779 in 1905, and 152,140 in 1906. Since 1906 the run has not improved. Gill nets are used here.

C. A. Johnson was the first man to operate commercially on this river, having erected a saltery on the left bank, about 23 miles above Smoky Point, in 1889, and operated it continuously from 1889 to 1898, both inclusive. This saltery was merged in the cannery of the Bering Sea Packing Co. In 1894 Mr. Johnson established and operated another saltery on the right bank of the river, about 12 miles from the bar, which he sold in 1899 to the Alaska Packers Association, who absorbed it in their cannery plant.

The Bering Sea Packing Co., a branch of the Alaska Improvement Association, in 1890 built the first cannery on the river, this being located on the left bank near the first Johnson saltery. A small pack was first made in 1891. The plant was closed in 1892 and 1893, and as the location had proven far from suitable, it was, in 1894, moved to a point on the left bank, about 15 miles above Smoky Point, where it was operated until 1896. The next year it was sold to the Alaska Packers Association. The machinery and equipment were utilized in the latter company's cannery, and the old location abandoned.

In 1893 Charles Nelson established a saltery on the left bank of the Ugashik, immediately above the last site of the Bering Sea Packing Co. It was operated in 1893 and 1894, and then sold to the Alaska Packers Association, who closed it down.

In 1893 the Alaska Packers Association also built a saltery on the left bank of the river about a mile below the last site of the Bering Sea Packing Co. It was operated each year until 1895, when it was merged into the association's cannery.

In 1895 the Alaska Packers Association built a cannery, known as the Ugashik Fishing Station, on the right bank of the river immediately above the pilot station, which is about 12 miles from the bar. It made the first pack in 1896 and packed every year until 1907, when it was closed. In 1906 its outfit was destroyed in the San Francisco fire, and it was decided to operate it as a saltery, but the burning down of the Coffee Creek cannery of the association on the Kvichak, caused a change in the plans, and a part of the saved outfit of the latter was sent to the Ugashik and the plant operated as a cannery.

The Bristol Packing Co. built a cannery on the left bank of the river about 25 miles from Smoky Point in 1900. A pack was made the same year and the plant operated continuously until 1906, when it was shut down, and a small salting crew operated a portion of the plant. Eventually the plant was dismantled without operating again as a cannery.

In 1901 the Alaska Packers Association built and put into operation another cannery about 15 miles up the river from the other one. In 1906 this plant was shut down and eventually it was dismantled.

In 1901 the Red Salmon Canning Co. also built and operated a cannery still farther up the river and has operated it continuously to date.

#### KUSKOKWIM RIVER.

This, one of the great rivers of Alaska, has been but little exploited as yet. Very little accurate data have been obtainable about the river until within the last couple of years, and this relates mainly to the bay and a few miles of the adjacent river, which the United States Coast and Geodetic Survey has charted.

We know that the river has considerable runs of salmon, but usually ice conditions have been such in the spring that a cannery crew frequently could not get in in time to prepare for the run. In 1906 a salting outfit was sent here by Seattle dealers, but arrived too late for the run of fish. The outfit was cached at Bethel.

During the last three years some mild curing of king salmon has been carried on here, but the lack of cold storage, both ashore and on the vessels operating to and from the river, has prevented any considerable development of this industry.

#### ARCTIC OCEAN.

Although it is known that there are good runs of salmon in some of the rivers debouching into the Arctic, the ice and other conditions have deterred people from attempting to extend their operations into this region. In 1912, however, the Midnight Sun Packing Co. built and operated a small cannery on Kotzebue Sound, in the Arctic Ocean. A small pack, mostly of Dolly Varden trout, was made in that and subsequent years.

BRITISH COLUMBIA.<sup>a</sup>

*Fraser River.*—This, the largest river in British Columbia (it is over 1,000 miles in length), has been important from a fishery standpoint ever since salmon canning was taken up as a commercial proposition.

The Hudson Bay Co. was the first to engage in the preparation of salmon for commercial purposes; the company bought the fish from the Indians and pickled them in barrels for export, mainly to the Hawaiian Islands and Asia. At times this export amounted to as much as 4,000 barrels a year. The company claimed a monopoly of the fisheries, but with the revocation of its license in 1858 this claim fell. Several salteries were subsequently established on the Fraser River by whites.

In the early sixties some canned salmon was prepared in a small way for local use, but the industry was not taken up commercially until 1867, when Ewen & Wise started at New Westminster. In 1870 Deas & Co. started at Deas Island. Of these two the only one to continue was Ewen & Co., who had succeeded Ewen & Wise, and they continued in business until they sold out to the British Columbia Packers' Association in 1902.

In 1872 Holbrook & Co. purchased a small cannery which had been started at Sapperton by Capt. Stamp sometime before, and operated it for a few years.

In 1876 there were three canneries running, consisting of Holbrook & Co., Ewen & Co., and the British Columbia Canning Co. (Deas Island).

The following year this was increased by English & Co. and Finlayson & Lane, the latter quitting after one season, being succeeded in 1878 by Lane, Pike & Nelson. King & Co., the British Columbia cannery (Annieville), and the Delta cannery also commenced operations the latter year.

In 1879 Holbrook & Co., and Lane, Pike & Nelson dropped out, and Haigh & Sons (succeeded in 1884 by the Bon Accord Packing Co.) commenced operations.

King & Co. were burned out in 1880, and Adair & Co., afterward known as the Wellington Packing Co., commenced. A year later Laidlaw & Co. commenced operations.

In 1882 the British Union Packing Co., afterwards known as the Harlock Packing Co., commenced packing salmon. The British-American cannery and J. H. Todd & Sons (Richmond cannery) also began operations.

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<sup>a</sup> The author is indebted to Henry Doyle, of Vancouver, British Columbia, for practically all of the historical data relating to the canning industry of British Columbia, and hereby expresses his deep appreciation for this and many other courtesies.

Joseph Spratt started a floating cannery, known as "Spratt's Ark," in 1883; he retired at the end of two years. E. A. Wadhams also began operations in 1883. In 1887 the Holly cannery was built on Lulu Island opposite Deas Island. The high water of June, 1894, partly destroyed it and the site was abandoned.

No more additional plants were built until Hobson & Co. started in 1889. The Canoe Pass Canning Co. also started the same year, as did J. H. Todd & Sons with their Beaver cannery.

The Anglo British Columbia Packing Co. was formed in 1891, taking over the canneries formerly operated by the British Columbia Packing Co. (old Annieville plant), E. A. Wadhams, British-American Packing Co., Canoe Pass Canning Co., Duncan & Batchelor (Britannia cannery), and English & Co. (Phoenix cannery).

In 1892 the Terra Nova Canning Co. began operations, and the next year the Lulu Island Canning Co., Steveston Canning Co., Pacific Coast Packing Co., Canadian Pacific Packing Co., Short & Squair, and Butimar & Dawson (at Steveston), all commenced operations.

In 1894 the Gulf of Georgia Canning Co., Dinsmore Island Canning Co., Sea Island Packing Co., and the Fishermen's Packing Co. all built and began to operate canneries.

The Alliance Canning Co., Atlas Canning Co., Boutilliar & Co., and the Star Canning Co. commenced operations in 1895.

There was considerable development in 1896, when the Anglo-American Canning Co., Fraser River Industrial Co., Hume & Co., Provincial Canning Co., Westham Island Packing Co., Westminster Packing Co., and the Vancouver Packing Co. all started canning.

In 1897 the Premier Canning Co., Sinclair Canning Co., Western Fisheries, Cleve Canning Co., Welsh Bros., Currie, McWilliams & Fowler, Butimar & Dawson (at Canoe Pass), Colonial Canning Co., and the Fraser Canning Co. all began operating.

The English Bay cannery was added to the list in 1898, but the Sinclair Canning Co. and Western Fisheries plants were both destroyed by fire at New Westminster and not rebuilt. The plant of the Steveston Canning Co. was absorbed that year by the Federation Brand Salmon Canning Co. and the cannery renamed the "Lighthouse" cannery.

In 1899 the Greenwood Canning Co., Scottish Canadian Canning Co., St. Mungo Canning Co., Wurzburg & Co., and Acme Canning Co. all began active operations, while in 1900 the Great Northern Canning Co. was the only addition to the list. In 1900 the United Canneries (Ltd.) was formed to take over the Gulf of Georgia, English Bay, and Scottish Canadian plants, and the Canadian Canning Co. this year also absorbed the Star, Fraser, and Vancouver canneries. In 1901 the National Packing Co. built at Eagle Harbour.

Like the other canning sections, British Columbia suffered in 1901 from an oversupply of canned salmon, due to the large number of plants which had been erected and which were producing more salmon than market could be found for. At this juncture the British Columbia Packers Association was formed. It embraced 29 out of the 48 plants on the Fraser River and 12 of those situated in Northern British Columbia waters, including the following plants: Ewen & Co., Delta, Harlock, Wellington, Lulu Island, Terra Nova, Pacific Coast, Canadian Pacific, Short & Squair (Imperial cannery), Brunswick canneries at Steveston and Canoe Pass, Dinsmore Island, Sea Island, Fishermen's Packing Co., Reliance Cannery, Atlas Cannery, Boutilliar & Co., Hume & Co., Anglo-American, Provincial, Westham Island, Westminster Packing Co., Premier, Cleve, Welsh Bros., Currie, McWilliams & Fowler, Colonial, Greenwood, Wurzburg & Co., and the Acme Canning Co. In 1914 the corporation style was changed to the British Columbia Fishing & Packing Co., Ltd.

In 1905 the Burrard Canning Co., Steveston Canning Co., Butimar & Dawson, Unique Cannery, and the Vancouver Fish & Canning Co. were all built and operated. The latter was burned in the middle of the season. The following year the Great West Packing Co. cannery was built at Steveston; the Nye Canning Co. operated for part of the season on False Creek in Vancouver, and the Capital City Canning Co. built a plant at Victoria.

*Skeena River.*—The first cannery to be built on the Skeena River was in 1877, when a man named Neill built one at Inverness. In 1878 the Windsor Canning Co., consisting of Henry Saunders, W. H. Dempster, and John Wilson, of Victoria, established a cannery at Aberdeen.

There were no additions until in 1883, when the Balmoral cannery, the British-American, and Robert Cunningham canneries were started.

In 1889 the North Pacific was started and in 1890 the Standard. In 1891 the Anglo British Columbia Packing Co. bought the British-American cannery and the North Pacific Canning Co. cannery. In 1892 the Claxton, and in 1895 the Carlisle, canneries were built. The Peter Herman (afterwards the Skeena River Commercial Co.) and Turnbull canneries were built in 1900. The last named operated only four seasons.

In 1902 the British Columbia Packers Association acquired the Balmoral, Cunningham, and Standard canneries.

In 1903 the Cassiar cannery was built. The next year the Alexandria Packing Co. was started. It was later acquired by the British Columbia Packers Association, as was also the Dominion cannery, which was built in 1906.

There have been no additions to the canneries on this river since 1906.

*Rivers Inlet.*—The first cannery to be built and operated on Rivers Inlet was in 1881 by Shot, Bolt & Draney, afterwards the British Columbia Canning Co. The Wannuck cannery was built in 1884, the Good Hope in 1895, the Brunswick in 1896, the Wadhams and the Vancouver in 1897.

There were no changes until 1902, when the British Columbia Packers Association acquired the Wadhams, Brunswick, Wannuck, and Vancouver, the two latter being dismantled and the two former enlarged correspondingly.

In 1906 the Beaver cannery was built by J. H. Todd & Sons, the Kildalla cannery by the Kildalla Packing Co., and the Strathcona cannery by Bain & Wilson, the latter afterwards being acquired by the Wallace Fisheries (Ltd.).

*Nass River.*—The first cannery to be built on the Nass River was by Henry Croasdale in 1881, and it operated for four years. The Douglas Packing Co. built a cannery here in 1882 and operated it for two years. Both were then shut down owing to the fact that the locations were too far up the river for steamers to move the packs. In 1888 the plants were dismantled and removed to Nass Harbor and Mill Bay, respectively. In 1889 the Cascade Packing Co. commenced operations, but the plant was dismantled in 1893.

In 1903 the Pacific Northern cannery was built near the mouth of Observatory Inlet, and in 1905 it was purchased by John Wallace, who moved it to Arrandale. In the latter year the Port Nelson Canning & Salting Co. started. In 1908 the Mill Bay cannery was purchased by the Kincolith Packing Co. In 1911 the Arrandale and Port Nelson canneries were bought by the Anglo British Columbia Packing Co., and in the following year the Nass Harbor cannery was bought by the British Columbia Packers Association.

*Vancouver Island.*—The first cannery to be built on Vancouver Island was the one on Clayoquot Sound, which was built in 1895 by the Clayoquot Sound Canning Co. The Alberni Packing Co. cannery on Alberni Canal was first operated in 1903. In 1905 J. H. Todd & Sons built a cannery at Esquimalt Harbor, as did also the Capital City Canning Co. the same year.

*Alert Bay.*—The Alert Bay cannery of the Alert Bay Canning Co. was opened in 1881.

#### SALMON FISHING IN THE HEADWATERS.

Considerable salmon fishing is carried on in the headwaters of certain of the larger rivers of the coast, of which no account appears in the data of the commercial fisheries. This is due to the fact that the fishing is usually of a desultory character, the fisheries are few in number and scattered widely, and while the catch in the aggregate is considerable it does not amount to much in any one spot.

The Columbia River is a typical example of such a stream. Commercial fishing is usually considered as ending at Celilo, about 150 miles from the mouth. As a matter of fact, salmon fishing for market or for home use is carried on to a considerable extent along the main river and also on the Snake and the Yakima, tributaries of the Columbia. In nearly all cases hook and line and spears are used alone, but on the Snake River, near Lewiston, in Idaho, are several rather important haul-seine fisheries. Fishing is carried on at these places in the spring for steelhead trout and in the fall for chinook and silver salmon and steelhead trout. As many as 25 salmon have been taken at one time. While this may seem a small number to one habituated to the large catches farther down the river, in the aggregate it amounts to a considerable quantity.

Considerable local fishing is carried on along the various Oregon streams above the sections usually fished by commercial fishermen. Most of this is done by ranchers living along the streams, and while by far the greater part is for home consumption a small proportion is sold.

On the Yukon River and its tributaries considerable salmon fishing is prosecuted. Much of this is done by natives for the use of themselves and their dogs, but at places white fishermen operate for a portion of the year and sell their catches in near-by settlements or at the mining camps. No effort has ever been made to secure statistics of the extent of this fishery.

### III. APPARATUS AND METHODS OF THE FISHERIES.

#### GILL NETS.

The gill net is the oldest and most popular form of apparatus in use in the salmon fisheries of the Pacific coast. There are two kinds, drift and set, these names clearly expressing the difference between them. Fine flax or linen twine is generally used in their manufacture, although in some places cotton twine is employed, and it has usually 12 threads and is laid slack. They are hung in the ordinary manner—to a rope with cork floats to support the upper portion of the gear, and to a line with lead sinkers attached, which keeps the net vertical in the water and all its meshes properly distended. The nets are tanned, usually several times each season.

Drift nets vary greatly in length and depth, depending upon the width of the fishing channels, the depth of water, etc. On the Sacramento River they average about 300 fathoms in length, are 45 meshes deep, and have a stretch mesh of from  $7\frac{1}{2}$  to  $9\frac{1}{2}$  inches. On the coastal rivers of Oregon these nets average about 125 fathoms in length, and are about 36 meshes in depth, the mesh varying with the species of salmon sought. On the Columbia River the nets average about 250 fathoms in length and have a stretch mesh for chinooks of 9 to  $9\frac{1}{2}$  inches. On the Willamette River, the principal tributary of the Columbia, they average about 75 fathoms in length, with meshes of 8 and  $9\frac{1}{2}$  inches. On Willapa Harbor drift gill nets run from 100 to 250 fathoms in length, are 30 meshes deep, with stretch meshes of 7 and  $8\frac{1}{2}$  inches. On Grays Harbor they average 100 fathoms in length, the chinook nets run from 24 to 45 meshes in depth, with a stretch mesh of 9 inches, while the silver or coho nets are 35 meshes in depth, with a stretch mesh of 7 inches. In the Puget Sound region the nets average 300 fathoms in length, with meshes suitable for the particular species sought. In Alaskan waters the nets vary greatly in length and depth, depending upon the places where fished.

Drift gill netting is prosecuted chiefly in the estuaries of the rivers in and near the channels. If the water is clear the nets are set only at night, but should the water be muddy or discolored with glacial silt, fishing can be carried on either night or day. Night fishing is most common in the States, while day fishing is most common in Alaska. When fishing in rivers it is necessary to work in a straight stretch of water of fairly uniform depth and free from snags or sharp ledges, these being called "reaches."





FIG. 1.—COLUMBIA RIVER POWER GILL NET BOAT.

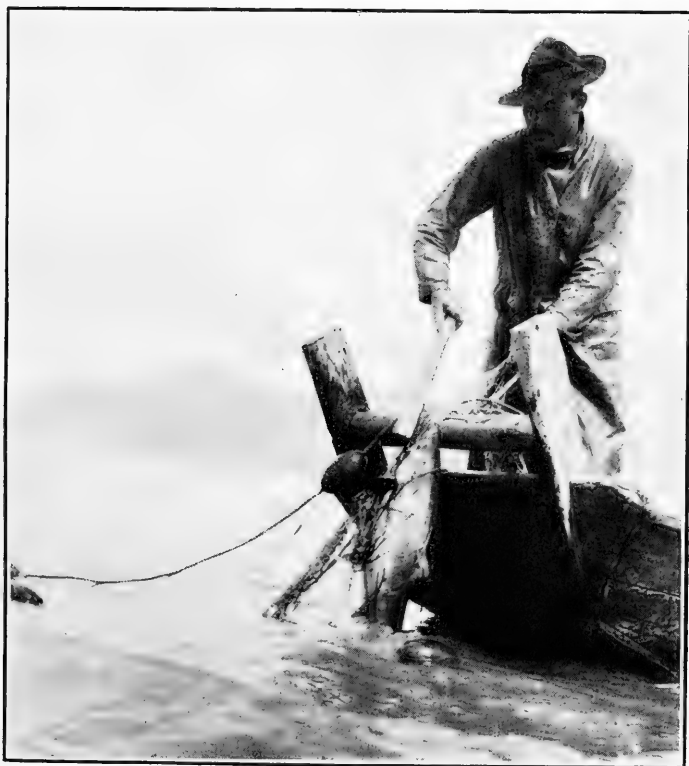
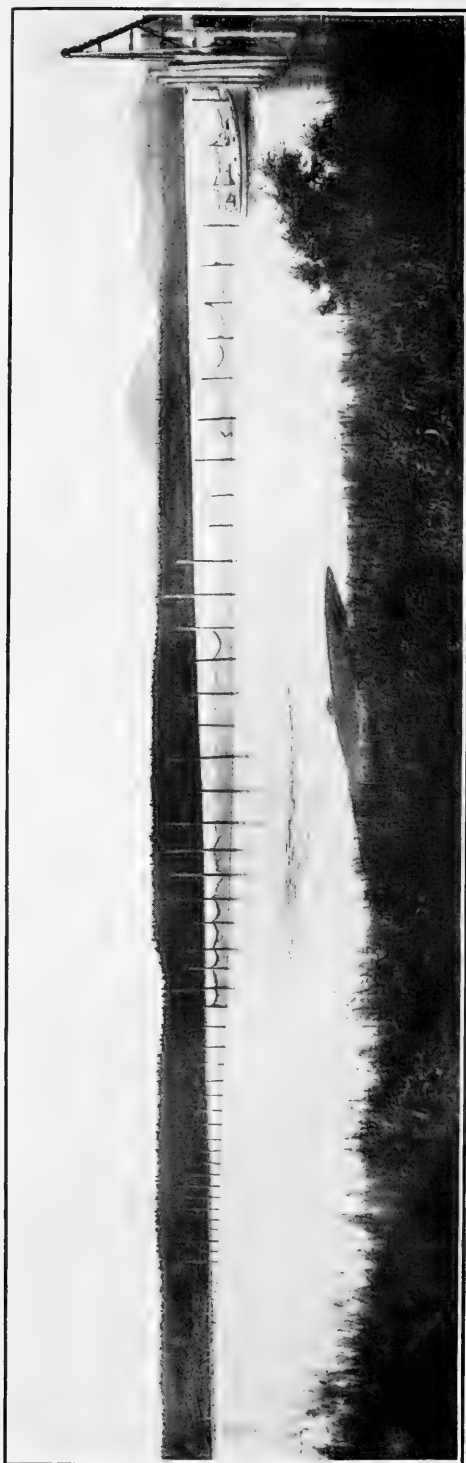


FIG. 2—REMOVING THE SALMON FROM A GILL NET.



SALMON RACK ACROSS WOOD RIVER, ALASKA.

In setting the net the boat puller rows slowly across the stream while the other man pays out the apparatus, to the first end of which a buoy has been attached. When about two-thirds of the gear is out, the boat is turned downstream at nearly right angles to her former course, so that the net, when set, approximates the shape of the letter L. The net is laid out at nearly right angles or diagonally to the river's course, so that it will intercept the salmon that are running in, and is usually put out about an hour before high-water slack and taken in about an hour after the turn of the tide. In Alaska the fishermen usually fish on both the high and low slack. The nets are allowed to drift for the time specified, the fishermen drifting along at one end, then the net is hauled into the boat over a wooden roller fixed in the stern, and the fish, which have become gilled in the meshes, are removed, stunned or killed by a blow on the head, and thrown into the bottom of the boat.

Set gill nets are made in the same way as drift nets, in many instances being fragments of the latter, and are usually operated in the upper reaches of the rivers. They vary in length from 10 to 100 fathoms, from 35 to 65 meshes in depth, and have the same sizes of meshes as the drift nets, the size varying, of course, with the species sought for. Sometimes these nets are staked, sometimes anchored, while occasionally only one end is tied to the shore or a stake set in the water.

On the flats off the mouth of the Stikine River, in southeast Alaska, a combination of the drift and set method is followed. A double set of stakes, about 6 feet apart, are set out from the shore for a distance of several hundred yards. An hour or two before slack water the fishermen pay out the net parallel to the line of stakes and about 50 feet from them. The tide drifts the net down until it is caught against the stakes, which retain it until slack water, when the fisherman takes it up and repeats from the opposite direction on the next turn of the tide.

#### HAUL SEINES.

On the Columbia River, where this form of apparatus plays a prominent part in the fisheries, the nets vary in length from 100 to 400 fathoms; the shallowest end is from 35 to 40 meshes deep, but it rapidly increases in width and is from 120 to 140 meshes deep at the other wing. The "bunt," or bag, in the central part of the net is about 50 fathoms long. These nets are usually hauled on the numerous sand bars which are a very noticeable feature of the river at low tide. Buildings are erected on piles on these sand flats, in which the men and horses take refuge at high tide, when the bars are covered with water. Operations begin as soon as the beach or bar uncovers, so that the men can wade about. The net is placed in a large seine

boat, with the shore end attached to a dory. At the signal the seine boat is headed offshore, while the dory heads toward the bar. As the seine boat circles around against the current the net is paid out in the shape of a semicircle. The dory men hurry to the bar with the shore end of the net, the idea being to get that in as soon as possible in order to prevent the escape of the salmon in that direction. As soon as this has been accomplished, the outer shore line is brought to the bar, when several horses are hitched to the line and begin to haul in the net, care being taken by the men to work it against the current as much as practicable, and to get it in as speedily as they can in order to prevent the escape of salmon either by jumping over the cork line or finding some outlet below the footrope or lead line.

The only other place on the coast where haul seines are important is at Karluk, on Kodiak Island, in Alaska. Here the seines are hauled upon the narrow gravel spit dividing the lagoon from the strait, and practically the same method is followed as in the Columbia River.

#### DIVER NETS.

These are in use in the Columbia River, mainly throughout the middle and upper portions of the river. They vary from 100 to 200 fathoms in length and are used almost exclusively for chinook salmon. In construction they somewhat resemble a trammel net. Two nets are attached together side by side. The outer one, or the one toward the oncoming fish, has a larger mesh than the other, so that if the fish manages to pass through the first, it will be caught in the smaller meshes of the second.

#### DIP NETS.

These consist of an iron hoop secured to the end of a stout pole with a bag-shaped net fastened to the hoop. They are generally used at the cascades on the rivers, small platforms being erected upon which the operator stands while fishing. Indians formerly used them to a large extent, but, owing to the steady decline in the number of Indians, and the appropriation of favorable spots by the whites for other forms of apparatus, they are but little used now.

#### SQUAW NETS.

This type is virtually a set net. It consists of an oblong sheet of gill netting, about 12 feet long and 8 feet deep, its lower edge weighted to keep it down, and its upper edge attached to a pole that floats at the surface, and is held by a line or lines to another projecting pole which is securely fastened to the shore, so that it will not swing around with the strain of the swift current on the net. A single block is attached to the pole, and through this passes a rope,



FIG. 1.—DIPPING SALMON FROM THE COPPER RIVER, ALASKA.

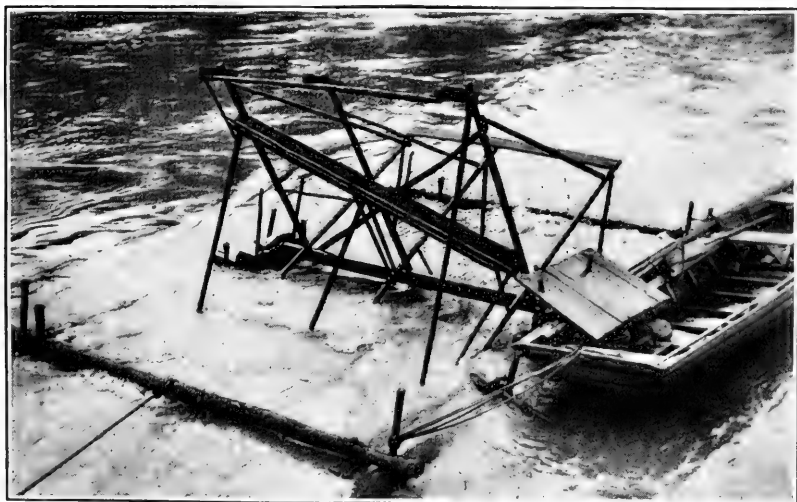


FIG. 2.—FISH WHEEL, YUKON RIVER, ALASKA.



FIG. 1.—A SCOW LOAD OF SALMON.



FIG. 2.—PURSE SEINE CREW DELIVERING FISH TO CANNERY TENDER.

thus making a tackle for the more convenient manipulation of the net. The dip-net fishermen of the Columbia River use this net, which derives its name from the fact that it used to be commonly operated by Indian squaws for taking salmon. But few are now in use, for the same reasons as given for the decline in the use of dip nets.

#### PURSE SEINES.

This form of apparatus is in quite general use in Puget Sound and southeast Alaska, and has proved highly effective in these deep, swift waters. These seines are about 200 fathoms long, 25 fathoms in the bunt, and 20 fathoms in the wings, all with a  $3\frac{1}{4}$ -inch stretch mesh. The foot line is heavily leaded and the bridles are about 10 feet long. The purse line is made of  $1\frac{1}{2}$ -inch hemp. The rings through which the purse line is rove measure about 5 inches in diameter and are made of galvanized iron.

Purse seining for salmon in Puget Sound and waters north of same is one of the most important methods in use in the fisheries. In the type of vessel used in this fishery there has probably been greater improvement than in any other branch of the fisheries of the coast. In the early days row scows were in use, but now vessels with power are used.

In 1903 the first gasoline-powered purse seine boat appeared on the Pacific coast salmon fishing grounds in Puget Sound. The vessel was named the *Pioneer* and she was equipped with a 5-horsepower engine. The first season she easily demonstrated her vast superiority over the other purse seiners in the quickness with which she could reach a school of fish after it was sighted and in surrounding it with her seine. The next year there were a few more built or equipped, and the number has steadily increased until at the present time practically all except a few in southeast Alaska are equipped with motor engines.

The first power seine boats were only about 30 feet in length and had small power. As they were few in numbers, there was virtually no competition, and high power and speed were not a necessity. As the boats increased in numbers, however, competition became keener, and the first types of boats with their small power were quickly thrown into the shade by the newer types, which averaged between 45 and 55 feet in length, with 45 to 75 horsepower engines.

When motive power was introduced in the vessels, it was natural that the fishermen should soon introduce winches for the purpose of hauling in the nets, as the whole work could then be done by the one engine.

The purse seine vessels are built with rounded sterns. On an elevated section of the stern is set a movable platform on a pivot.

The after end of this platform has a long roller. The purse seine is stowed on this platform, the head rope with corks on one side and the foot line on the other, so that there will be no tangling when the seine is paid out.

When the lookout sights a school of fish, the seiner is run down close to it and a rowboat launched. One man takes his place in this with the rope from one end of the seine and acts as a pivot, while the seiner circles around the school, the crew paying out the seine as she moves along. When it is all out, the vessel runs alongside the rowboat and takes aboard the other rope. Attaching this and the rope from the other end to the power winch, the circle around the fish is rapidly narrowed, and the slack of the seine as it comes in is stowed back on the platform. Around the bottom of the seine and through galvanized iron rings about 5 inches in diameter, runs the purse line. As this is hauled into the boat, the open space at the bottom is rapidly closed up just as a handbag would be through the drawing together of the pursing string at the top. During this operation the nonpower purse seiners have a man standing alongside the rail who throws a pole into the center in order to drive the fish away from the open section. He is so skillful in this work that almost invariably the pole comes back to his hand as the pressure of the waters forces it up again. When the bottom has been pursed up the fishermen hauling by hand can move more leisurely, but with the power winches in use the hauling in of the net is a comparatively easy matter, and the pole thrower is dispensed with.

When all the fish are in the bunt and the latter alongside, the fish are generally dipped out by means of a dip net balanced on the end of a tackle. A fisherman lowers it into the seine, scoops up a load of salmon, and as the net is hauled up, guides it over the vessel, and then trips it and dumps the fish into the hold.

The Puget Sound purse seiners meet the salmon off the entrance to the Strait of San Juan de Fuca and follow the sockeyes till they have passed out of American waters, what are known as the Salmon Banks, off the lower end of San Juan Island, being the principal rendezvous during the run of sockeyes. After this run is over they go up the Sound and fish for dogs and cohos, and later go to the head of the Sound and fish for dogs, cohos, chinooks, and steel-head trout. In southeast Alaska they follow the fish all over the bays, straits, and sounds of that section. Purse seines are used in a few other places, but the fishery is secondary to those with other forms of apparatus.

This style of fishing is said to have been introduced on Puget Sound by the Chinese in 1886.





FIG. 1.—FLOATING TRAP NET.

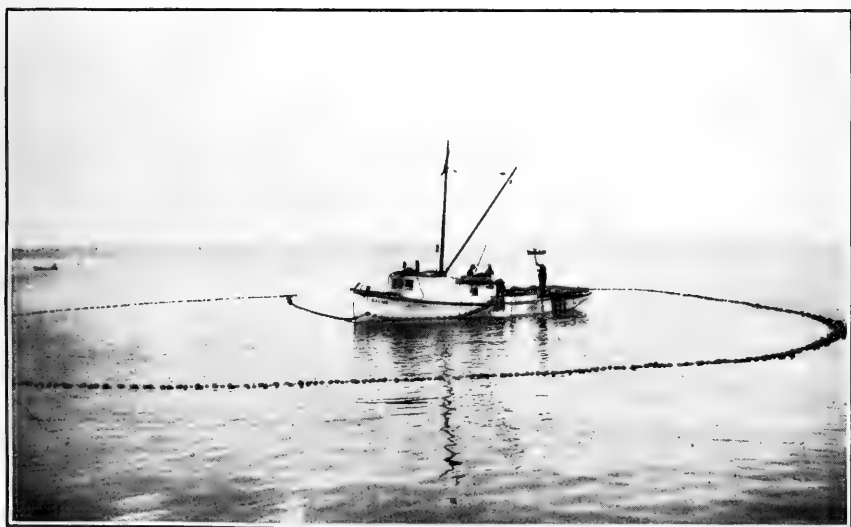


FIG. 2.—PURSE SEINER HAULING IN NET.



FIG. 1.—DIPPING THE SALMON FROM THE PURSE SEINE.

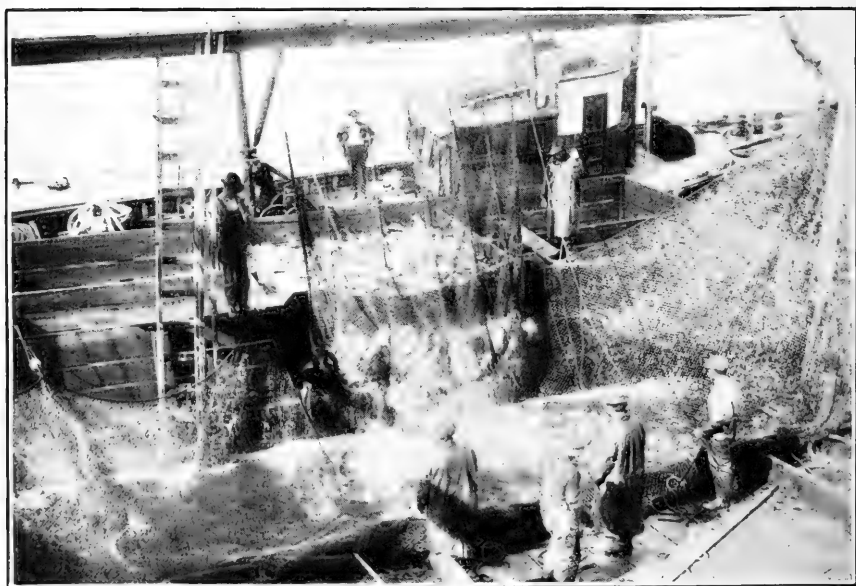


FIG. 2.—BRAILING THE SALMON FROM THE TRAP NET.

## TRAPS OR POUND NETS.

A trap is stationary and consists of webbing, or part webbing and part wire netting, held in place and position by driven piles. This piling usually is held together above water by a continuous line of wood stringers, also used to fasten webbing to or to walk on if necessary.

In building, the "lead" is first constructed. This runs at right angles, or very nearly so, to the shore, and consists of a straight line of stakes, to which wire or net webbing is hung from top of high water, or a little higher, to the bottom, making a straight, solid wall.

At a little distance inshore of the outer end of the lead begin what are called the "hearts." These are V-shaped and turned toward the lead, beginning at a distance of 30 to 40 feet on either side of same and running in the same general direction, the "big heart" or outer heart first, the inner heart, supplementing the first, being smaller, and the end of the outer heart leading into it. Some traps have only one heart. The narrow end of the inner heart leads into the "pot" and forms what is known as the "tunnel." The tunnel ends in a long and narrow opening, running up and down the long way, and is held in position by ropes and rods. Below this is what is known as the "apron," a sheet of web stretched from the bottom of the heart upward to the pot, in order to lead the fish into the tunnel when swimming low in the water, and to obviate the necessity of building the pot clear to the bottom, which would be expensive, as the pots of the traps are usually in quite deep water. If the trap is intended to catch the fish coming from only one direction, the lead generally runs to and is attached to one side of the entrance to the outer heart on the side opposite to that from which the fish are expected.

Some traps have "jiggers" (a hook-shaped extension of the outer heart) on each side, and sometimes on only one side, which help to turn the fish in the required direction.

The "pot" is built out beyond the inner heart and immediately adjoining same. It is a square compartment, with web walls and bottom connected in the shape of a large square sack, fastened to piling on all sides. This pot is hauled up and down by means of ropes and tackles, either by hand or, as is most popular, by steam.

The "spiller" is another square compartment adjoining either end of the pot (sometimes there are two spillers, one at each end), and is simply a container for fish. A small tunnel leads the fish from the pot into the spiller, whence the fishermen lift them out. This is accomplished by closing the tunnel from the pot, after which the ropes holding the front of the spiller are loosened and the net

wall allowed to drop almost to the level of the water. A steam or gasoline tug then pushes a scow alongside the spiller and takes position on the outside of this scow. From the deck of the tug a derrick is rigged with a running line from the steam capstan through the block at the top of the derrick. This line is attached to the far end of a net apron, called a "brailer," which is heavily weighted by having chains along each side and leaded crossways at several places. A small boat is run inside the spiller, and the men in this draw the brailer across the barge and let it sink in the spiller. The fish soon gather over it, when the steam capstan quickly reels it in, the net folding over as drawn in from its far side and spilling the fish out on the scow. Men on the scow pick out and throw overboard the unsalable and nonedible fish. The apron is then drawn back across the pot and the operation repeated so long as any fish remain. In this manner a trap with many tons of salmon in it is quickly emptied.

Traps, like nearly all other fixed fishing appliances, are built on the knowledge that salmon, like most other fishes, have a tendency to follow a given course in the water, whether a natural shore line or an artificial obstruction resembling one; also that the fish very seldom turns in its own wake. The trap has taken advantage of these natural tendencies of the fish, and is arranged so that, although the salmon may turn, he will continually be led by the wall of net toward and into the trap.

If a trap is located in a place where fish play and where an eddy exists, and the fish run one way with the incoming tide and the opposite with the outgoing, it will fish from both directions; if located where the fish simply pass by, as, for instance, on a point or reef, it will fish from one side only.

A variation of the trap, to be used in places where piles can not be driven, is the floating trap. An experimental trap of this variety was used at Uganuk, on Kodiak Island, Alaska, as early as 1896. Its use was abandoned in 1897, not to be resumed until some years later. A number of floating traps (of the type invented by J. R. Heckman, of Ketchikan, Alaska) have been and are being used in southeast Alaska, the first having been installed in 1907. The design of this trap follows the shape of an ordinary Puget Sound driven trap. It is constructed of logs, 20 to 26 inches at the butt, bolted and braced together in one solid frame. Suspended from this frame through the logs are 2½-inch pipes extending down in the water 30 feet. Halfway down these pipes and also on the extreme lower ends are eyebolts, to which the web is drawn down and fastened. Thus the web is kept in place as well as if the pipes were driven piles. The lead is also a continuation of large piles or logs bolted firmly together with similarly suspended pipes and webbing.



FIG. 1.—RACKS AND RUNWAYS FROM WHICH INDIANS GAFF SALMON, CHILKOOT RIVER, ALASKA.

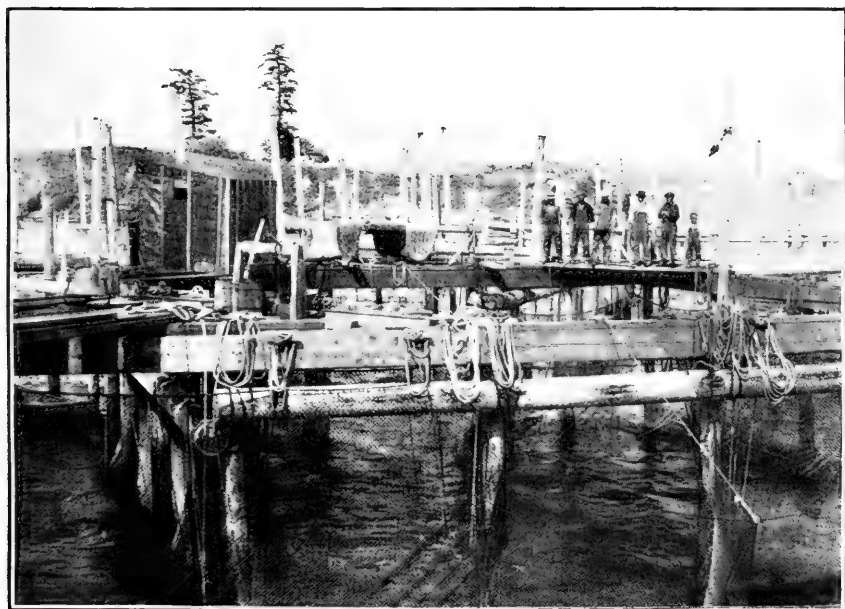


FIG. 2.—THE POT AND SPILLER OF A TRAP NET.



FIG. 1.—TROLLING FOR SALMON ON PUGET SOUND WITH POWER BOAT.



FIG. 2.—PUGET SOUND PURSE SEINE BOATS AT RICHARDSON, WASH.

The so-called wooden traps on the Columbia River are essentially weirs, being a modification of the brush weirs or traps used by the Indians for the capture of salmon long before the advent of the white men. They are built on shore, of piling and planks, the latter arranged like slats with spaces between. The bowl, or pot, is provided with a movable trapdoor that can be opened during the closed season and on Sundays, so that the fish can pass through and run upstream. These weirs, after being built, are launched into the river, placed in proper position near the shore, and then ballasted so that they sink to the bottom.

According to Collins,<sup>a</sup> "pound nets were introduced on the Columbia River in 1879. In May of that year O. P. Graham, formerly of Green Bay, Wis., built a pound net on the river similar to those used on the Great Lakes. The success of this venture led to the employment of more apparatus of this kind, and many fishermen went West to participate in the fishery."

According to the same authority <sup>b</sup> H. B. Kirby, who had previously fished on the Great Lakes, set a pound net in Puget Sound about 1883, but it was a complete failure. On March 15, 1888, he again set a pound net, which he had designed to meet the new conditions, at Birch Bay Head, in the Gulf of Georgia. It proved a complete success, and was the forerunner of the present large number which are set annually in these waters.

In Alaska the first trap was set in Cook Inlet about 1885. British Columbia refused to permit the use of pound nets in its waters until 1904, when their use was allowed within certain limited regions.

Some of these trap nets, especially on Puget Sound, have proved extremely valuable. The years 1898 and 1899 covered practically the high-water mark, as several desirable locations changed hands in those years at prices ranging from \$20,000 to \$90,000 for single traps, the original expense of which did not exceed \$5,000. But few have brought such high prices since, however, owing to the popularity of a cheaper apparatus, the purse seine.

The location of sites for these nets is regulated by law in Oregon, Washington, and British Columbia, but in Alaska the procedure is not well defined and has proved rather confusing to strangers. Some acquire the shore line by mineral location or by the use of scrip, while still others have merely a squatter's right.

Under the existing fish-trap laws applicable to Alaska, a fish trap may be operated anywhere along the coast of Alaska, 300 or more yards from the mouth of any salmon stream, and along the shores of all rivers—excepting those emptying into Cook Inlet, the streams on Afognak Island, and in Wood River—where the same are at least 500 feet wide.

<sup>a</sup> Report on the fisheries of the Pacific Coast of the United States. By J. W. Collins. Report of Commissioner of Fish and Fisheries for 1888, p. 210. 1892.

<sup>b</sup> *Ibid.*, p. 257.

A clear water distance of 600 yards laterally and 100 yards endwise must be maintained between all traps. At the present time there is no law regulating the length of leads, the maximum depth of water in which the pot may be driven, or the use or occupancy of the trap sites.

It has been decided by the highest courts within the past year (1915) that title to the upland conveys no title to the trap owner who may be in front. The tide lands of Alaska are not of sufficient commercial importance as yet to enter into this controversy. At the present time there is no tide-land law applicable to Alaska affecting the upland owners or the trap-site locators.

At the present time it is probable the canner who is on the ground first and installs a working trap can assert his right to any unoccupied trap site regardless of who fished it the previous season. As a general rule, however, the cannery respect the rights of rivals in the same fishing region, and a trap location once recognized as that of a certain individual or company is rarely jumped so long as the original locator cares to maintain a trap on it.

Within the bounds of the forest reserve no land can be acquired except by lease, which may be secured from the United States forestry agent, Ketchikan, Alaska.

#### INDIAN TRAPS.

The natives, especially in Alaska, have various ingenious methods of catching salmon. In the Bering Sea rivers they catch them by means of wickerwork traps, made somewhat after the general style of a fyke net. These are composed of a series of cylindrical and conical baskets, fitting into each other, with a small opening in the end connecting one with the other and the series terminating in a tube with a removable bottom, through which the captive fish are extracted. Some of the baskets are from 15 to 25 feet in length and are secured with stakes driven into the river bottom, while the leader, composed of square sections of wickerwork, is held in place by stakes.

During the summer of 1910 the author found and destroyed an ingenious native trap set in Tamgas stream, Annette Island, south-east Alaska. This stream is a short and narrow one, draining a lake, about midway of which are a succession of cascades. In the narrowest part of the latter, and in the part up which the fish swim, a rack had been constructed of poles driven into the bottom and covered with wire netting, so as almost wholly to prevent salmon from passing up. Just below, and running parallel to the rack and at right angles to the shore, was placed a box flume with a flaring mouth at the outer end. At the shore end the flume turned sharply at right angles and discharged into a square box with slat bottom





FIG. 1.—A SCOW FISH WHEEL.



FIG. 2.—PUGET SOUND SALMON TRAP.



A STATIONARY FISH WHEEL.

and covered over with boughs. The fish in ascending the stream would be stopped by the rack and in swimming around many of them would be carried by the current into and down the flume, eventually landing in the receiving box alongside the shore.

#### WHEELS.

Fish wheels are of two kinds, the floating or scow wheel, which can be moved from point to point if need be, and the shore wheel, which is a fixed apparatus. They operate in exactly the same manner, however. The stationary wheel is located along the shore in a place where experience has shown that the salmon pass. Here an abutment is built of wood and stone, high enough to protect it from an ordinary rise in the river. To this is attached the necessary framework for holding the wheel. The latter is composed of three large scoop-shaped dip nets made of galvanized-iron wire netting with a mesh of  $3\frac{1}{2}$  to 4 inches. These nets are the buckets of the wheel and they are so arranged on a horizontal axis that the wheel is kept in constant motion by the current, and thus picks up any fish which come within its sweep. The nets are fixed at such an angle that as they revolve their contents fall into a box chute through which the fish slide into a large bin on the shore. The wheels range in size from 9 to 32 feet in diameter and from 5 to 15 feet in width, and cost from \$1,500 to \$8,000, the average being about \$4,000. A number of them have long leaders of piling running out into the river, which aid in leading the salmon into the range of the wheel.

The scow wheel consists of a large square-ended scow that is usually decked at one end and open at the other. Several stanchions, some 8 to 10 feet high, support a framework upon which an awning is spread to protect the fish from the sun's rays and the crew from the elements. To one end of the scow are fastened two upright posts, which are guyed by wooden supports, while projecting from the same end is the framework which supports the wheel, the latter being constructed in the same way as the stationary wheel, but on a smaller scale. In operation the scow is anchored with the wheel end pointing downstream, and as the wheel is revolved by the current, the fish caught fall from the net into a box chute, through which they slide into the scow. As stationary wheels can be used only at certain stages of water, the scow wheel is a necessary substitute to be used at such times as the former can not be operated, or in places where it is not feasible to build a stationary wheel.

The above forms of wheels are used exclusively on the Columbia River.

An ingenious device is used by some of the wheelmen on the Columbia River in getting their catch to the canneries, a few miles farther down the river. The salmon are tied together in bunches and

these attached to air-tight casks and sent down the stream. At the canneries small balconies have been constructed at the water end of the building. A man armed with a pair of field glasses is stationed here, and as soon as he sights one of these casks he notifies a boatman, who goes out and tows in the cask and salmon. About 800 pounds of salmon are attached to a keg, and a tag showing the wheel from which shipped is tied to the fish.

In 1908 the first fish wheel to be located in the coastal waters of Alaska was operated in the Taku River, in southeast Alaska. The wheel was set between two 4-foot scows, stationed parallel to each other, and each 40 feet in length. The wheel had two dips, each 22 feet in width and hung with netting. It could be moved from place to place, the same as the scow wheels on the Columbia River. It was operated throughout the king and red salmon runs, but caught almost no salmon, and was not set in the succeeding years.

For many years the natives of the interior of Alaska have been resorting to the banks of the Yukon River and its tributaries in order to secure a sufficient supply of salmon to sustain them through the succeeding winter. The favorite apparatus of these natives is a type of fish wheel of local invention, which has been in use by them for many years, probably long before the white man first saw the Yukon. A square framework of timbers is constructed in the water and moored to the bank by ropes. A wheel, composed of three dips, is placed in this, the axle resting upon the framework. The shape of the dip is such that the salmon caught roll off it into a trough, down which they slide into a boat moored between the wheel and the shore. Although crude in construction, it is very effective and a large number of them are set each season.

The Columbia River fish wheel is a patented device. It was first used by the patentees, S. W. Williams & Bro., in 1879, and for several years they retained a monopoly in its use. A number are now operating on the river. The device was not new even when patented, as the natives of the Yukon River Basin had been using a precisely similar principle for an unknown number of years previously, while a similar "fishing machine," as it is called, had been in use prior to this time and is still used by white fishermen on the Roanoke River in North Carolina.

#### REEF NETS.

As the name indicates, this device is used around the reefs. Under natural conditions the reef is covered with kelp throughout its length, the kelp floating at the top of the water. A channel is cut through this, and in it is placed a tunnel of rope and netting, which flares at the outer end, in deep water, and into which is thatched grass, kelp leaves, or any other article resembling submarine growth,

to hide the construction sufficiently to avoid frightening the fish. Short leads of kelp are also arranged on the sides so as to draw the fish to the tunnel, which is held in place by anchors. On the reef itself two boats are anchored parallel to each other and some feet apart. An apron of netting is fastened to the rear of the two boats, while the other end extends under the small end of the tunnel and is kept in place by men in the forward ends of the boats, who have lines fastened so the apron can be raised by them. The device can only be used with the tide entering the tunnel at the large end. When the fish have entered and passed through the tunnel upon the apron, the men raise the floating end of the latter and dump them into the boats.

At one time this was a favorite device of the Puget Sound natives for catching sockeye salmon. They attribute its origin to one of the Hudson Bay Co.'s employees, who, they say, taught them a long time ago how to catch salmon in this way. Owing to the large number of men required to work them, and the fact that they can be worked only at certain stages of tide and in favorable weather, these nets gradually have been supplanted by other devices. In 1909 but five were used, and these were operated off the shores of San Juan, Henry, Steuart, and Lummi Islands, and in the vicinity of Point Roberts. Even less are used at present.

#### TROLLING.

Each year the catching of salmon by trolling becomes of increasing importance commercially. For some years sportsmen had this exciting and delightful occupation to themselves, but eventually the mild curers created such a persistent and profitable demand for king, or chinook, salmon that the fishermen, who had previously restricted their operations to the use of nets during the annual spawning runs, which last but a small portion of the year, began to follow up the fish both before and after the spawning run and soon discovered that they were to be found in certain regions throughout nearly every month in the year.

Trolling has several advantages from the fisherman's point of view over seine, gill net, and trap fishing. To engage in it, one does not require any very expensive gear, a boat, hooks, and lines being all that is required. Then, there are no licenses to pay and no seasons to observe in many sections, as the fishing is done in many instances beyond the jurisdiction of State waters.

The fishermen comprise all nationalities. While the majority of them are professionals, men of all walks of life are to be found engaging in the business, some on account of their health, others because of reverses in business or lack of work, while still others engage in it from pure love of the outdoor life.

The Monterey Bay (Cal.) trollers use 48 cotton line generally. A few inches below the main lead an additional line is added, with a small sinker on it. This gives two lines and hooks, and as the main line has but the one lead, and that above the junction with the branch line, it floats somewhat above the latter, which is weighted down with a sinker. The main stem is about 20 fathoms in length, while the branch lines are about 5 fathoms each. These lines cost about \$3.50 each. No spoon is used, but bait almost invariably. A few fishermen use a spread of stout steel wire, 4 feet long, with 5 or 6 feet of line on each end of the spread, two lines and hooks.

On the upper Sacramento River (mainly at Redding and Keswick) some fishing is done with hand lines. A small catch was made here in 1908, but none were so caught in 1909.

Even as early as 1895 trolling was carried on in the Siuslaw River, Oreg., for chinook and silver salmon.

About 1912 the fishermen living along the lower Columbia River discovered that salmon could be taken by trolling off the bar. A number of them went into the business regularly, while their numbers were greatly swelled by the addition of many of the net fishermen during the regular closed seasons on the river, these not applying to trollers. Some idea of the growth of this fishery off the Columbia River Bar may be gained when it is stated that in September, 1915, about 500 boats were engaged in it.

At Oregon City and other places on the Willamette River a number of chinook salmon are caught by means of trolling each year, mainly by sportsmen. A spoon is quite generally employed in place of bait. The fishermen claim that the salmon are not feeding at this time, as their stomachs are shriveled up.

For a number of years the Indians living at the reservation on Neah Bay, Wash., have annually caught large numbers of silver and chinook salmon in the Strait of Juan de Fuca. A large number of white fishermen also engage in this fishery at the present time in the same waters, while others troll for the same species, but more particularly silvers, in parts of Puget Sound proper. The ordinary trolling line, with a spoon instead of bait, is used.

Many of the trollers use power boats, and in this event four and sometimes six lines are used. One and sometimes two short poles are run out from each side of the boat (when two are used on a side, one is shorter than the other), the butt being dropped into a chock. Two lines are generally trailed from the stern. At the end of each pole is a very short line with a small tin can attached. A few pebbles are in the can, and as the launch moves slowly through the water with all her lines set, the troller knows when he has a bite by the rattling of the pebbles in the can. Each of the lines attached to a pole is also connected with the boat by a short line from the

side of the latter to a point on the line about 20 feet from where it is attached to the pole. When a fish is hooked, the fisherman merely pulls in the line by means of the short piece and then can haul the fish in hand over hand.

The most remarkable trolling region is in southeast Alaska. For some years the Indians here had been catching king salmon for their own use during the spring months, and about the middle of January, 1905, king salmon were noticed in large numbers in the vicinity of Ketchikan. Observing the Indians catching these, several white fishermen decided to engage in the pursuit, shipping the product fresh to Puget Sound ports. They met with such success that 271,644 pounds, valued at \$15,600, were shipped. The next year several of the mild-cure dealers established plants in this region, thus furnishing a convenient and profitable market for the catch, and as a result the fishery has grown until in 1915 2,170,400 pounds of king salmon and 54,400 pounds of coho salmon were caught and marketed. The length of the fishing season has also lengthened until now the business is prosecuted vigorously during about seven months in the year, and in a desultory manner for two or three months more, only the severe winter weather preventing operations the rest of the year.

In southeast Alaska the fishermen generally use either the Hendryx Seattle trout-bait spoon no. 5 or the Hendryx Puget Sound no. 8. The former comes in nickel or brass or nickel and brass, the full nickel preferred. The Siwash hook no. 9/0, known as the Victoria hook in British Columbia, is in quite general use. As a rule, but one hook is used, and this hangs from a ring attached to a swivel just above the spoon, while the point of the hook comes a little below the bottom of the spoon. Occasionally double or treble hooks are used. Some fishermen use bait, and when this is done the herring, the bait almost universally employed, is so hooked through the body as, when placed in the water, to stretch out almost straight and face forward as in life.

There are a large number of power-boat trollers in this region. These trollers generally use one pole on a side and one at the stern. The rowboat trollers use but one line, which is attached to a thwart in the boat, handy to their reach when rowing, and trailing out from the stern of the boat.

The trollers usually have temporary camps where they congregate while the fish are to be found in that section, moving on to some more favorable spot when the fish begin to get scarce.

Reports from the trollers of southeast Alaska prove that all species of salmon will take the hook at some time or other in the salt waters of this region, an examination of their stomachs generally showing that they are either feeding or in a condition to feed.

A small commercial fishery is carried on in this region for coho salmon, mainly in August and September, in the neighborhood of Turnabout Island, in Frederick Sound. A Stewart spoon with two hooks on one ring is used, baited with herring in such a way that the fish is straightened out and faced toward the spoon. The sportsmen of Ketchikan also fish with rod and reel for this species in the neighborhood of Gravina Island, using a Hendryx spoon (kidney bait no. 6), which is silvery in color on one side and red on the other. Although much smaller than the king, the coho salmon is more gamey.

During the latter part of March the Gulf of Georgia, in British Columbia, is invaded by large schools of young coho salmon, locally called "bluebacks." They evidently come in from the sea by way of the Straits of Fuca, as their presence is at first apparent in the lower gulf, especially among the reefs and islands off Gabriola Pass. On their arrival these fish are only about a couple of pounds weight, but increase in size very rapidly, with correspondingly voracious appetites. They are to be found in the gulf throughout the spring and summer. By May the fish generally average close to three pounds each when dressed, while in July they are between four and six pounds in weight.

A number of fishermen with power and row boats engage in this fishery, the fish being either sold to the fresh markets or to the canneries.

Trolling lines and spoon baits of one form or another are used. In fishing from power boats the outer lines are attached to fish poles 15 to 18 feet long, rigged out on either side. Those poles are usually hinged at the foot of a short mast and lowered outboard by a halyard running through a block at the masthead, with the additional brace of a forward guy, which, with the drag of the lines aft, holds them in position. It has been customary to use from five to seven lines from each launch, the two outer lines leading from the ends of the poles; the next pair are attached to intermediate tips fastened halfway out on the main pole; while inboard lines are attached to smaller upright rods on either quarter.

The outer trolls are brought within reach (the poles being practically fixtures) by means of a short piece attached to each fishing line 15 or 20 feet from the point where it is fastened to the pole and leading inboard.

Recently, however, the Dominion authorities have decreed that a troller shall not use more than three lines from a boat when trolling for salmon. Should a man be alone in the boat three lines will keep him very busy if the fish are biting at all well.

Spoons are generally used. All shapes are employed, from the ordinary Siwash patterns to wobblers; brass or silver wobblers, of no. 4 and 5 sizes, are largely used by the fishermen. Spinners of 2 to



3 inches long are also popular. Copper, copper and silver, and brass spinners of the Siwash and Victoria patterns are very effective; while red beads, feathered hooks, or a piece of silvery salmon skin placed on the hook as an additional bait often add to the attraction of a spoon.

Quite generally the fishermen use single hooks on their spoons. Various lengths of line are used, but on the average about 60 feet for outside lines and 40 for inside are used. As fish can be landed much quicker with a short line, the fishermen generally shorten their lines to 20 or 30 feet when the fish are biting rapidly. Quite heavy lines are used from the pole to the sinker; from there extends a length of light line, and then a piece of wire, to which the spoon is attached. The sinker, which is usually between 2 and 3 pounds in weight when fishing from a power boat and about 1 pound when a rowboat is employed, is attached to the line about 18 feet from the spoon.

The best fishing times are in the early morning and evening, without regard to tidal conditions. The low slack water is always favorable to good fishing.

These fish are delicate flavored, but do not keep well, it being necessary to rush them to market if they are to be sold in a first-class condition.

Considerable numbers of these fish are taken by both American and Canadian fishermen on Swiftsure Banks, off Cape Flattery. As complaint had been made in 1914 that these fish were immature and were unfit for canning because of their appearance after being out of the water some hours, H. T. Graves, acting commissioner of agriculture for the State of Washington, which department is concerned with the wholesomeness of food products, made a thorough investigation of their fitness for food. In a letter to the Pacific Fisherman, Seattle, Wash., and published in that journal under date of August, 1914, he states, among other things, the following:

The question, therefore, for us to determine was to ascertain their value as a food product. The condition of these fish arriving at the various canneries was carefully noted; samples were selected for bacteriological analysis.

The fish when first taken from the water are very soft when compared with the other salmon. After they have been out of the water 12 hours the fish easily separates from the bony structures, and in the course of ordinary handling in the time which elapses between the hour of taking from the water until they are offered for packing at Sound canneries, which is anywhere from 12 to 48 hours, they become badly broken up and present a rather ugly and distasteful appearance, to say the least.

We found that many different methods of handling were being experimented with by the fishermen and by Puget Sound canneries, but without any noticeable effect. While from a physical observation one would imagine these fish as received at the Sound canneries to be unwholesome, a bacteriological examination by Dr. E. P. Fick, State bacteriologist, indicated that putrefaction was not present, although some of the specimens did contain a rather high bacteria count.

### BOW AND ARROW.

On the Tanana River, a tributary of the Yukon River, in Alaska, the Indians hunt salmon in birch-bark canoes with bow and arrow. As the canoe is paddled along and the Indian sees the dorsal fin of the salmon cutting the surface of the muddy water he shoots it. The tip of the arrow fits into a socket, and when struck the tip, which when loose is attached to the stock by a long string, comes out of the socket and the arrow floats, easily locating the fish for the fisherman.

### SPEAR AND GAFF.

Spears of varying shapes and styles have been in use by the Indians from time immemorial and are still employed on many rivers in which salmon run. With the exception of the Chilkoot and Chilkat Rivers of Alaska, practically all of the catch secured in this manner is consumed by the fishermen and their families. In the Chilkoot River the Indians have built numerous racks in the stream and on the banks, upon which they stand and hook the fish out with a gaff attached to a pole. The catch is sold to the cannery located on Chilkoot Inlet.

### SPORT FISHING FOR SALMON.

The number of sportsmen who improve the opportunity presented by the appearance of feeding springs and cohos is increasing yearly, and in time this promises to far excel the sport salmon fishing of the Atlantic coast.

On Puget Sound and lower British Columbia waters the anglers generally use ordinary trout fishing rods and tackle, with preferably a short trolling tip on the rod when out for coho. Small spinners of silver or copper, of about an inch in length, or else the small double Tacoma spoons, are very good. A strong gut leader or trace of fine piano wire is frequently used, as the fish's teeth would cut through an ordinary line. Where iron wire is used the salt water rusts it rapidly, and unless the precaution is taken to dry off the wire and oil it after using it can not be used for more than a couple of days. Sinkers of an ounce or two in weight are generally employed with fine line.

Many of the small spoons on the market have very cheap hooks, and these are apt to straighten out or break with the strain of a large fish. Hooks of the best steel will, however, stand up to this strain.

One of the favorite spots for anglers is at the falls on the Willamette River at Oregon City, Oreg. When the spring run of salmon appears in April, hundreds of anglers, many of them from far distant points, appear to participate in the sport during this month and in May. Many noted sportsmen have fished for salmon at this spot. Among them was Rudyard Kipling, and his experiences were woven into a short story.

The fishing ground is spread over a mile's length of the river, from Clackamas rapids to the deadline at the falls. It is not an uncommon sight to see 500 boats with from one to six fishermen and fisherwomen dotting the river on favorable days during the season.

Two methods of fishing are followed. The most popular is to anchor at the head of the Clackamas rapids or in swift water near the falls and allow the rush of water to spin the trolling hook. In the longer lengths of quieter water the sportsmen troll in slow motor boats or rowboats.

An inexperienced boatman is apt to find fishing in the rapids or near the falls somewhat dangerous, as the swift water may overturn his craft and carry him to his death before help can reach him.

There is a fishway in the dam, so that the fish can pass up this and into the river above the dam. No fishing is allowed closer than 100 feet of the mouth of this ladder. Up to 1915 there was a second deadline, 600 feet from the falls, beyond which no commercial fisherman could operate nets, but the Oregon Legislature in that year closed the Willamette to all net fishermen from the Clackamas rapids to the falls.

The salmon in the spring run on the Willamette will average about 25 pounds each, but examples weighing 50 pounds and over are not uncommon.

In 1914 the Salmon Club of Oregon was formed of anglers who desired to encourage the use of light tackle in the taking of large game fish, in place of the extremely heavy tackle heretofore used. The following rules were adopted:

The rods used may be made of any material except solid bamboo cane. They must not be less than 5 feet in length and weigh not over 6 ounces.

The line must not be heavier than the standard nine-thread linen line.

Any style of reel or spoon may be used and the wire leader must not exceed 3 feet in length.

The angler must reel in his fish, bring it to gaff unaided, and must do the gaffing himself. If a rod is broken at any time during the struggle with the fish it will disqualify the catch.

As a reward of merit the club awards bronze buttons to all anglers taking, on light tackle, salmon weighing 20 pounds or over; for a fish weighing over 30 pounds a silver button is given, and for any salmon over 40 pounds the lucky angler receives a gold button. Numerous additional prizes are also given by public-spirited citizens.

The season for light tackle on the Willamette River and all other inland streams of Oregon has been fixed by the club from January 1 to July 1.

In 1915 the first angler to win a gold button on the Willamette River did so on April 18, when he took a 42½-pound salmon. On the same day this same angler also won a silver button for a 32½-pound fish and a bronze button for a 26-pound fish.

## DANGERS TO THE INDUSTRY.

Man is undoubtedly the greatest present menace to the perpetuation of the great salmon fisheries of the Pacific coast. When the enormous number of fishermen engaged and the immense quantity of gear employed are considered, one sometimes wonders how any of the fish, in certain streams at least, escape. High water or low water, either of which will prevent certain forms of apparatus from fishing to any extent while such conditions prevail, storms which impede fishing, and the hundred and one small things which in the aggregate are of considerable importance, however, all aid in assisting the salmon in dodging the apparatus and reaching the spawning beds in safety, while, unless the stream is completely blocked by a tight barricade, an indeterminate number of salmon will escape all the pitfalls man and animals may set for them.

One very essential fact in connection with the annual runs of spawning salmon should not be lost sight of, and that is all salmon die after spawning once, and if more are allowed to reach the spawning beds than are necessary for the perpetuation of the race the excess are an economic waste. An excessive number of spawners on the beds is also harmful, in that the late comers stir up the gravel in which many of the eggs deposited by the early spawners have been sheltered, causing them to float up and become easy prey for the predaceous fishes and birds.

In some sections an almost idolatrous faith in the efficacy of artificial culture of fish for replenishing the ravages of man and animals is manifested, and nothing has done more harm than the prevalence of such an idea.

While it is an exceedingly difficult thing to prove, the consensus of opinion is that artificial culture does considerable good, yet the very fact that this can not be conclusively proven ought to be a warning to all concerned not to put blind faith in it alone.

When salmon are stripped by man, the eggs fertilized and retained in hatcheries until the young are born, and then planted as soon as the yolk sac has been absorbed, it is manifest that the only saving over the natural method is in reducing the loss in the egg stage. We know that many eggs, after being deposited naturally on the spawning beds, are devoured by other fishes, while sudden freshets and occasional droughts also claim their toll of eggs. It is highly probable, although we have no positive data on this point, that these losses far exceed those experienced in artificial salmon culture, and whatever this difference is it represents the extent to which salmon hatcheries should be credited as preservers of the industry, when the fry are planted immediately after the yolk sac has been absorbed. Many hatcheries, however, now hold the young fish until they reach the fingerling or yearling stage before planting them, thus greatly

reducing the dangers to which the fish are subject during this stage of their career, and thus adding materially to the value of the method.

In the opinion of the author, the best way in which to conserve the fisheries of the coast is by enacting and enforcing laws under which a certain proportion of the runs will be enabled to reach the spawning beds and perform the final and most important function of their lives unmolested. If this is done, there can be no question of the perpetuation of the industry, and if it is then supplemented by the work of hatcheries, which would reduce the loss in the egg and early fry stages, assurance on this point would be made doubly sure.

If unrestricted fishing is to prevail, however, with a dependence upon hatcheries alone to repair the ravages of man, the industry will suffer seriously, for, from the very nature of things, less and less fish will annually escape through the fishing zone, resulting in a continually lessening quantity of eggs being obtained at the hatcheries, and finally the latter will have to close down from sheer lack of material upon which to work.

Should eggs be brought to the hatchery from other streams, it would merely be "robbing Peter to pay Paul," and in the end the same result would follow in those streams.

Fortunately these matters are becoming increasingly plain to the people of the various States, Provinces, and Territories concerned, and, while a few selfish persons in each are seeking solely their own enrichment by any means possible, the greater number of those interested in fishing operations want to see the industry perpetuated and are willing to do almost anything that will work to this end.

Next to the fishing operations of man, the gravest danger to the salmon fisheries of the Pacific coast lies in the pollution of the rivers which the salmon ascend for spawning purposes. The salmon, both old and young, require pure cold water, and the immense runs which have annually ascended the streams for many years are doubtless due to the fact that such conditions have prevailed in them. The large increase in the population of the coast States within recent years, with the resulting increase of mills and factories, has greatly increased the amount of sewage from cities and towns and the waste from the manufacturing plants. Many of the latter have also constructed dams without adequate fishways, and these also wreak great havoc to the industry by cutting the fish off from the upper reaches of the rivers upon which constructed.

The emptying of sewage into streams ought to be made a crime. It is an exceedingly crude method of dealing with it, and, instead of disposing of the filth, merely transfers it from one place to another, making the water unfit for use at points farther downstream and spreading diseases and death amongst, not only the finny, but also human, users of it.

In the present condition of sanitary science it is a comparatively easy matter to dispose of this filth by modern septic devices, and a number of cities are now disposing of their sewage in this manner.

The irrigation ditch, a comparatively new product on this coast, while of great benefit in developing the arid lands in certain sections, as at present operated is a considerable menace to the salmon fisheries. But few ditches have screens at their head, and as a result many thousands of young salmon slowly making their way to their ocean home pass into and down these to an early doom. Every owner of such a ditch should be compelled to place at its head a screen with fine enough mesh to prevent absolutely the passage through the same of even the tiniest baby salmon.

Next to man and his methods the trout is undoubtedly one of the greatest enemies of the salmon. The Dolly Varden follow the salmon from the sea to the spawning beds, and when the eggs are extruded devour countless thousands of them. Many and many a time the writer has seen on the spawning beds female red salmon swimming around with a cloud of trout spread out behind like a fan, following her every movement, eagerly waiting for the moment when the eggs shall appear.

In the summer, when the young are heading for the sea, the trout are lying in wait for them and again take their toll of countless thousands.

Much is said by certain people of the ravages amongst the salmon of certain animals, as the seal, sea lion, bear, eagle, kingfisher, crane, duck, loon, and hawk. While in the aggregate the ravages of these animals are considerable, they are barely a drop in the bucket as compared with the direct or indirect ravages of man and his agencies.

#### IV. FISHERMEN, OTHER EMPLOYEES, ETC.

In the early days canning was a haphazard business, and workmen came and went as common laborers do in the wheat fields of the West. As the business increased in importance and the need of skilled labor became imperative, men were put to certain work and kept at it from season to season, with the result that in a few years a corps of highly skilled laborers had been evolved, and this had much to do with the rapid extension of the industry.

For many years Chinese formed the greater part of the cannery employees, the superintendent, foreman, clerks, machinists, and watchmen alone being white. No other laborers have ever been found to do the work as well or with as little trouble as the Chinese. In times of heavy runs, when the cannery would have to operate almost night and day in order to take advantage of what might be the last run for the season of the sometimes erratic salmon, the Chinese were always willing, even eager, to do their utmost to fill the cans, and, if fed with the especial food they insisted upon having and due regard was had to certain racial susceptibilities, the cannery man could almost invariably depend upon the Chinese doing their full duty.

The Chinese-exclusion law cut off the supply of Chinese, and as the years went by and their ranks became decimated by death, disease, and the return of many to China, the contractors were compelled to fill up the rapidly depleting crews with Japanese, Filipinos, Mexicans, Porto Ricans, etc., with the result that to-day in many canneries special quarters have to be provided for certain of the races—more particularly the Chinese and Japanese—in order to prevent racial hatred from engendering brawls and disturbances.

In Alaska the Japanese now compose about one-half of the cannery employees. While a few cannery men express themselves as well pleased with this class of labor, the majority find it troublesome.

In Alaska and at a few places in the States Indians are employed in the canneries. In Alaska more would be employed if they could be secured. They make fair workpeople but are rather unreliable about remaining through the season.

The supplying of this kind of labor is done largely through the contract system. In the large cities along the coast are labor agencies, mainly owned by Chinese, which make a specialty of furnishing labor for this work. In the agreement between the canning company and the contractor the company guarantees to pack a cer-

tain number of cases during the coming season and the latter agrees to do all the work from the time the fish are delivered on the wharf until they are ready to ship at the end of the season for a certain fixed sum per case. Should the cannery pack more than the guaranteed number, which it usually does if possible, the excess has to be paid for at the rate per case already agreed upon, while if the pack for any reason should fall below the contract amount, the company must pay for the shortage the same as though they had been packed. The company transports the Chinese to the field of work and carries them to the home port at the end of the season. It provides them with a bunk house and furnishes fuel, water, and salt. The contractor sends along with each crew a "boss," who has charge of the crew, and furnishes their food, the company transporting this free.

White men do the greater part of the fishing for salmon, many nationalities being represented, but Scandinavians and Italians predominate almost everywhere. A number of Greeks are to be found fishing on the Sacramento, while Slavonians do most of the purse seining on Puget Sound. The native-born American is not often found actually engaged in fishing, but frequently is the owner of the gear or has a responsible position in the packing plants.

A number of Indians participate in the fisheries of Alaska, and a few fish in Washington. The only Chinese engaged in fishing are in Monterey Bay. A number of Japanese also fish in this bay, which is the only place in American territory where they fish for salmon. A considerable number of Japanese engage in fishing in Canadian waters.

At many places on the coast, particularly in Alaska, fishing is a hazardous occupation. In Alaska most of it is done in the bays, sounds, and straits, where storms are frequent, and the annual loss of life is heavy. The records of the Alaska Fishermen's Union show for its members the following losses of life by drowning: 1905, 10 men; 1906, 5 men; 1907, 10 men; 1908, 17 men; and 1909, 17 men.

The fishermen early saw the advantages of organization, and nearly every river now has a union, which is subordinate to the general organization. One of the most typical of these is the Alaska Fishermen's Union, which has active jurisdiction over all sections of Alaska, except a portion of southeast Alaska. This organization enters into contracts with the salmon canneries and salteries, by which the rates of wages, duties, etc., of the fishermen are fixed in advance for a period of three years. As a result of this mutual agreement upon terms but little trouble is experienced with the fishermen, who generally conform scrupulously to the terms of the contract, and strikes and bickerings, which were very common a few years ago, are now almost entirely absent.



## FISHERIES OF BOUNDARY WATERS.

Waters which form the boundaries between States or between nations, and in which fishing is carried on by the citizens of both, have almost always proved bones of contention, and the Pacific coast has been no exception to the rule.

The Columbia River, which forms the boundary between Oregon and Washington, affords a typical example of the evils which can result from a division of responsibility between two States. For many years each State enacted laws regulating the fisheries of the river with very slight regard usually to laws already in force in the other State. As a result of this the fishermen transferred their residence for license purposes from State to State as the laws of one or the other best suited their particular purposes.

The fishermen and packers also were in apparently irreconcilable conflict as to the proper means to be taken to conserve the fisheries, and each session of the legislatures saw strong lobbies present to work for certain selfish ends, while the few earnest men who had the real welfare of the fisheries of the river at heart had difficulty in making the slightest headway against the influence of these lobbies.

To further complicate the matter, in 1894 Oregon claimed that, under the provisions of the enabling act admitting it as a State, it had jurisdiction to the Washington shore, and proceeded to arrest Washington men who were fishing in what was the open season according to Washington law but the closed season under Oregon law.

In June, 1908, the voters of the State of Oregon had presented for their consideration two bills radically affecting the waters of Columbia River. One closed the river east of the mouth of the Sandy River against all fishing of any kind except with hook and line, and was originated by gill-net fishermen of the lower river for the purpose of eliminating fish wheels in the upper waters. This bill was the first presented to the people, and when it appeared the upriver men retaliated by presenting a bill affecting the lower river to such an extent that it practically prohibited the net fishermen from operating.

Very much to the surprise of all concerned both bills were passed and became laws on July 1, to take effect, as provided, on August 25 and September 10, respectively. The Oregon master fish warden proceeded to enforce both laws, arresting all violators on both sides of the river, irrespective of whether or not they were operating under a Washington or Oregon license, and incidentally did the fisheries a great service by bringing prominently before the public the anomalous condition of affairs which was occasioned by the archaic system under which the fisheries of the Columbia were governed. The State of Washington appealed to the United States courts, which, after argument, issued an injunction preventing the warden from enforcing the laws so far as the Washington fishermen were concerned.

In the meantime the attention of the General Government had been drawn to the apparently irreconcilable conflict between the two States, and fearing that in the mêlée the interests of the fisheries would be lost sight of, President Roosevelt, in a message to Congress, after reciting briefly the lack of harmony in jurisdiction by the States, recommended that the General Government take over the control of the fisheries of the Columbia, as well as other interstate rivers.

This had the effect of bringing matters to a head, and negotiations were soon in progress looking to the preparation of a treaty between the two States by which uniform laws would be adopted, and thus each State have concurrent jurisdiction to the opposite shore of the river. The legislatures each appointed a committee of eight members to confer and frame joint legislation. The two committees met in Seattle, Wash., early in 1909, and agreed upon the following recommendations:

First. A spring closed season from March 1 to May 1.

Second. A fall closed season from August 25 to September 10.

Third. A Sunday closed season from 8 p. m. Saturday of each week to 6 p. m. the Sunday following between the 1st day of May and the 25th day of August.

Fourth. We suggest the mutual recognition by each State of the licenses issued to floating gear by the other State.

Fifth. That the State of Oregon repeal chapter 89 of the session laws of Oregon for the year 1907, relative to the operation of purse seines and other like gear on the Columbia River.

Sixth. We recommend the enactment of similar laws in both States carrying an appropriation of at least \$2,500 in each State and providing for the destruction of seals and sea lions and the granting of a bounty on the same, to be \$2.50 for seals and \$5 for sea lions.

Seventh. We recommend the repeal of both the fish bills passed under the provisions of the initiative and referendum in June, 1907, by the people of the State of Oregon, said bills being designated on the ballot as 318, 319 and 332, 333.

The recommendations were enacted into law by both States, and at the same time the State of Washington in its bill also prohibited fishing for salmon within 3 miles of the mouth of the Columbia between March 1 and May 1 and between August 25 and September 10, or salmon fishing on tributaries of the Columbia, except the Snake, between June 1 and September 15; and also prohibited fishing for salmon by any means save by hook and line in the Kalama, Lewis, Wind, Little White Salmon, Wenatchee, Methow, and Spokane Rivers and in the Columbia River 1 mile below the mouth of any of the rivers named. The agreement was subjected to a rather severe strain, however, when it was discovered that the Oregon Legislature had failed to provide the same closed periods for the tributaries that were enacted for the Columbia, thus leaving the Willamette, Clackamas, Lewis and Clark, and Youngs Rivers and Spikanon Creek open to fishing for 15 days in March and 15 days in April, while the

Columbia was closed. The cry of bad faith was at once raised by the Washington fishermen, and for a short time it appeared that the agreement would be broken at the very beginning. The Oregon Board of Fish Commissioners took the matter up, however, and by order closed these streams to all fishing during the times of closed season on the Columbia, and thus restored peace once more.

This agreement continued in force until 1915, when the legislature of each State prepared for a thorough revision of its fishery code. In order to make this revision more effective, committees from both legislatures were appointed and held joint meetings in Portland, where they mutually agreed upon laws covering the fisheries of the Columbia River, and in order to make this agreement more binding the following chapter was inserted in the codes finally adopted:

All laws and regulations now existing, or which may be necessary for regulating, protecting, or preserving fish in the waters of the Columbia River, over which the States of Oregon and Washington have concurrent jurisdiction, or any other waters within either of said States, which would affect said concurrent jurisdiction, shall be made, changed, altered, and amended in whole or in part only with the mutual consent and approbation of both States.

As such an agreement between two States requires the approval of Congress, a bill ratifying same was introduced in Congress on December 16, 1915. This compact was not acted on by the 64th Congress.

The conditions which prevail in Puget Sound adjacent to the boundary between Washington and British Columbia have also been the cause of serious anxiety to those interested in the perpetuation of the salmon fisheries. The great schools of sockeye salmon which are on their way from the ocean to the spawning beds in the Fraser River pass through this section, and it is here that the greater part of the fishing is done. The Province of British Columbia and the State of Washington are vitally interested in the preservation of these fish, but, unfortunately, they seem to be unable to agree upon any definite policy with regard to their conservation, although it would appear to the unprejudiced observer that it ought to be possible to find some common ground upon which they could agree.

This condition of affairs on Puget Sound and similar conditions in other boundary waters led the General Government to take up the matter, and on April 11, 1908, a convention was concluded between this country and Great Britain for the protection and preservation of the food fishes in international boundary waters of the United States and Canada. Both Governments appointed international commissioners—Dr. David Starr Jordan for the United States and S. T. Bastedo (who was succeeded later by Prof. Edward Ernest Prince) for Canada—whose duty it was to investigate conditions prevailing in these waters and to recommend a system of uniform and common international regulations. After an exhaustive investiga-

tion the commissioners submitted recommendations, which included the following affecting the boundary waters dividing the State of Washington and the Province of British Columbia, these waters being defined as the Strait of Juan de Fuca, and those parts of Washington Sound, the Gulf of Georgia, and Puget Sound lying between the parallels of 48° 10' and 49° 20':

#### GENERAL REGULATIONS.

3. *Disposition of prohibited catch.*—In case any fish is unintentionally captured contrary to the prohibitions or restrictions contained in any of the following regulations, such fish shall, if possible, be immediately returned alive and uninjured to the water.

4. *Dynamite, poisonous substances, etc.*—No person shall place or use quicklime, dynamite, explosive, or poisonous substances, or electric device in treaty waters for the purpose of capturing or killing fish.

5. *Pollution of waters.*—No person shall place or pass, or allow to pass, into treaty waters any substance offensive to fishes, injurious to fish life, or destructive to fish fry or to the food of fish fry, unless permitted so to do under any law passed by the legislative authority having jurisdiction.

No person shall deposit dead fish, fish offal, or gurry in treaty waters, or on ice formed thereon, except in gurry grounds established by the duly constituted authorities.

6. *Capture of fishes for propagation or for scientific purposes.*—Nothing contained in these regulations shall prohibit or interfere with the taking of any fishes at any time for propagation or hatchery purposes, and obtaining at any time or by any method specimens of fishes for scientific purposes under authority granted for Canadian treaty waters by the duly constituted authorities in Canada and for United States treaty waters by the duly constituted authorities in the United States.

12. *Capture of immature salmon prohibited.*—No salmon or steelhead of less than 3 pounds in weight shall be fished for, killed, or captured in treaty waters.

13. *Salmon weirs, etc., above tidal limits prohibited.*—No salmon and no steelhead shall be fished for, killed, or captured by means of a net of any sort, any weir or any fish wheel, above tidal limits in any river in treaty waters.

14. *Close season for sturgeon.*—During the term of four years next following the date of the promulgation of these regulations no sturgeon shall be fished for, killed, or captured in treaty waters.

15. *Capture of fish for fertilizer or oil prohibited.*—Fishes useful for human food shall not be fished for, killed, or captured in treaty waters for use in the manufacture of fertilizer, or of oil other than oil for food or medicinal purposes.

16. *Naked hooks and spears prohibited.*—No spear, grappling hook, or naked hook, and no artificial bait with more than three hooks, or more than one burr of three hooks attached thereto, shall be used for the capture of fish in treaty waters. This regulation shall not prohibit the use of a gaff in hook-and-line fishing.

17. *Torching prohibited.*—No torch, flambeau, or other artificial light shall be used as a lure for fish in treaty waters.

The following regulations relate specifically to the waters named:

#### STRAIT OF JUAN DE FUCA AND ADJACENT WATERS.

The following regulations (62 to 66, inclusive) shall apply to the Strait of Juan de Fuca, those parts of Washington Sound, the Gulf of Georgia, and Puget Sound lying between the parallels of 48° 10' and 49° 20' north latitude:

62. *Close season for salmon.*—From August 25 to September 15 in each year, both days inclusive, no salmon or steelhead shall be fished for, killed, or captured for commercial purposes in these treaty waters; provided, however, that in the waters to the westward of a line drawn southward from Gonzales Point to the shore of the State of Washington silver salmon, or coho salmon, may be fished for, killed, or captured from September 1 to September 15 in each year, both days inclusive.

63. *Weekly close season for salmon and steelhead.*—From 6 o'clock Saturday morning to 6 o'clock on the Monday morning next succeeding, no salmon or steelhead shall be fished for, killed, or captured in these treaty waters.

It is, however, provided that in the waters to the westward of a line drawn southward from Gonzales Point to the shore of the State of Washington the weekly close season shall begin 12 hours earlier, and shall end 12 hours earlier.

64. *Construction of pound nets.*—All pound nets or other stationary appliances for the capture of salmon or steelhead shall be so constructed that no fish whatever shall be taken during the weekly close season. The erection or addition to the pound net of a jigger is prohibited.

65. *Location of pound nets.*—All pound nets shall be limited to a length of 2,500 feet, with an end passageway of at least 600 feet between one pound net and the next in a linear series, such distance being measured in continuation of the line of direction of the leader of such net, and a lateral passageway of at least 2,400 feet between one pound net and the next.

On and after January 1, 1911, the mesh in pound nets shall be 4 inches in extension in the leader and not less than 3 inches in other parts of the net.

66. *Nets other than pound nets.*—No purse net shall be used within 3 miles of the mouth of any river and no seine within 1 mile of the mouth of any river in these treaty waters.

No gill net of more than 900 feet in length or of a greater depth than 60 meshes shall be used in these treaty waters.

The effort to enact these regulations into law by our Congress met with decided objections not only on the part of the Puget Sound operators, but also from operators in other waters affected, with the result that the bill is now virtually dead.

## V. THE SALMON FISHERIES OF SIBERIA.

As on the Alaska coast, the aborigines of Siberia must have learned early of the excellent food qualities of the salmon which each year frequented the rivers of that country for spawning purposes, and not only ate them fresh but also dried large quantities for winter use of themselves and their dogs.

Owing to the inaccessibility of the Siberian coast, due mainly to the lack of transportation facilities for many years, and the decided objection of the Russian Government to travelers roaming over the country, partly because of the presence of political and criminal convicts, and partly because of a fear that they might learn too much of its resources, there has been but little written, especially with regard to its fishery resources, about this remote section of the Russian Empire, and what little has been published is usually filled with inaccuracies, due, doubtless, in many instances, to the fact that the writer generally had to get most of his information at second and third hand and was also unfamiliar with fishery subjects.

Most of the data given below were obtained directly from persons living in Siberia or Japan, most of whom are engaged in the fishing industry of Siberia, or from Americans who have on various occasions visited the country in order to view its fishing possibilities at first hand.

### SPECIES OF SALMON.

All five species of salmon are to be found along the Siberian coast. Although we have very little authentic data relating to their movements, these are doubtless similar to the runs on the Alaska coast, where climatic and other conditions are very similar. Nearly all streams from the Arctic Ocean to north China seem to have runs of one or more species. The steelhead does not appear to be an inhabitant of the Asian coast.

The fishing carried on by the Russians has usually been along the rivers of the mainland, principally in the Amur and on Sakhalin Island.

From very early times Japanese fishermen have frequented the Siberian coast and Sakhalin Island, the southern portion of the latter being owned by Japan, being drawn here mainly by the rich stores of salmon which could be secured easily and quickly and were so necessary to eke out the vast quantity needed to supply such a fish-eating nation as Japan.

The exhaustion of the fishery resources of many of the European waters belonging to Russia has forced some of her more enterprising fishermen to seek for new supplies in her Siberian waters, and as these resources become better known, and means of transportation are increased and improved, there will doubtless be a tremendous impetus given to their development.

#### FISHING DISTRICTS OF SIBERIA.

The Amur fishing district is subdivided into four districts, as follows: Nikolaievsk, Chnirahsky, Pronga, and Sakhalin. The first named consists of 22 fishing stations belonging to the municipality of Nikolaievsk and 35 to the Department of Domains. The shore line is about 230 miles. Next in importance is the Chnirahsky district, and this includes some very important and valuable fishing plants. In the Pronga district are also several good fishing plants. The Sakhalin Island district includes all the fisheries of Russian Sakhalin Island north of 50° north latitude.

The fisheries of the Usuri River, a tributary of the Amur, are controlled almost entirely by the local peasants, cossacks, and natives, who, owing to the inadequate means of transportation, are able to market but a small part of their catch otherwise than amongst themselves. The same is true also of Lake Hinka.

The Kamchatka region has had the most important development of recent years, and now comprises within its boundaries most of the salmon canneries of Siberia. There are about 187 fishing stations in this district, the vast majority of which are held by Japanese.

The Anadir district is said to be richer in fish than the southern districts of eastern Siberia. The chief commercial fisheries are concentrated near the Anadir River. A considerable quantity of salmon is frozen in this district for export.

#### FISHERY RIGHTS AND REGULATIONS.

Along the entire seacoast of Siberia, by virtue of the Russo-Japanese convention of 1907, concluded for 12 years, the Japanese are permitted to engage in fishing on equal terms with Russians. In such sections there is no restriction with regard to the nationality of the laborers employed or the method of preparing the fish, except that the manufacture of fish manure from fish of the salmon variety is prohibited. On the face of it this convention looks like an equitable agreement, but in putting the Japanese on the same footing as the Russians it subjected them to a lot of unstated and arbitrary laws, by-laws, and local regulations, besides making the tenure exceedingly short, virtually only one year, as a result of which Japanese capital refuses to erect more than the crudest of plants.

Fishing rights in the gulfs and bays not included in the Russo-Japanese convention, such as Peter the Great Bay, Imperial Harbor, Vanina Bay, Avatchinsk Bay, and others, as well as the rivers of Okhotsk and Kamchatka, are granted by the Governor General, without public tenders, to persons of good repute, but for one year only, and if they show their ability to establish a successful fishing station a lease for 12 years can be secured on the basis of paying a royalty of  $2\frac{1}{2}$  cents per pood (36.112 pounds) of prepared fish. Under the terms of the lease only Russian subjects can be employed at the stations, while all sailing vessels serving the stations must be under the Russian flag.

The regulations governing the river districts vary from those relating to coast concessions, and also vary from each other, as the local authorities in the river districts are authorized to issue temporary rules and regulations to cover local conditions.

On the Amur River, within the boundaries of the Nikolaievsk, Mariinsk, and Khabarovsk districts, the fishing stations are leased by public auction to the highest bidder, some on a long-term basis and others for only one year. At stations above the city of Nikolaievsk, within 30 miles of the Amur estuary and farther, no foreign labor is allowed. Below the city of Nikolaievsk foreign labor can be employed to handle the fish on shore, but the actual fishing can be done only by Russian subjects.

At the present time the chief aim of the Russian authorities is to break the monopoly the Japanese have of the fisheries along the greater part of the coast. This will be an exceedingly difficult thing to do, owing to the proximity of the Japanese to the Siberian coast, the ease with which they can transport by water the necessary supplies, etc., for carrying on the fisheries, the vastly greater skill in carrying on this work displayed by them over their Russian competitors, and their unlimited supply of cheap labor, while the Russian fisheries are badly hampered as a result of the few Russian subjects available for such work and the consequent high wage cost of same. Japan also has another big advantage in that she is at present almost the sole market for the greater part of the salmon and other fishes taken in Siberia. The very fact of this fish being necessary for feeding her people will cause Japan to battle hard to hold her present advantage.

The development of the salmon and other fisheries of Siberia has been much hampered by the disinclination of the Russian Government to permit foreigners to acquire fishing concessions except on very short tenure. As the Russians themselves are generally unskilled in fishing operations, and are compelled to do the work with Russian labor, which is quite scarce, they do but little with their concessions. American capital would doubtless be available for de-



veloping Siberia's fisheries were it assured of a sufficiently long tenure of lease with some other minor concessions.

#### APPARATUS EMPLOYED.

In the river districts somewhat primitive fishing apparatus is employed. Spears, dip nets, and the other simple forms which seem to be common to all savage tribes depending upon the water for the greater part of their subsistence, are all in use by the natives living along the upper reaches.

Weirs of a primitive type are also used. These have a lead consisting of willow poles and branches built from the river bank or a sand bank out into the stream. At the outer end is attached a net compartment with a lead, into which the fish, which have been following the lead in the search for an opening, pass. Two men in a boat are anchored close by, and as soon as 30 or 40 salmon have passed into the compartment, it is hauled up and the fish emptied into the boat, after which the net is reset.

Haul seines of varying lengths and depths are used in connection with the more important river fishing stations.

Along the coast the Japanese use a floating trap net somewhat similar to the type used in Alaska, also haul seines and a few gill nets.

#### ABUNDANCE OF SALMON.

It is exceedingly difficult to secure even approximate statistics of the Siberian catch of salmon, owing to the wide extent of coast, the totally inadequate means of transportation preventing close supervision, the presence of so many foreigners who go directly home with their catches at the end of the season, and the crude system of control in operation by the authorities.

The following table shows the catch of salmon in the four districts for the year 1898:

Districts.	Spring.	Summer.	Autumn.
Nikolaievsk .....	.....	7,464,896	4,685,480
Chnirahsky .....	60,000	873,000	2,662,000
Pronga .....	1,067,000	316,950	665,500
Sakhalin .....	666,000	635,000	748,000
Total .....	1,793,000	9,289,846	8,760,980

In the Anadir district the catch in 1909 was as follows: Cape St. Michael, 91,616; above Cape Neuman, 8,234; Anadir River, 150,746; Anadir River estuary, 9,864; Hanchelar River, 6,121; Cape Observation, 270,000; total, 536,581. The catch by natives and small Russian fishermen is estimated at about 3,000,000 and 500,000 fish, respectively. In addition to this, 130 barrels of caviar,

weighing 14 tons, were prepared, and there were 20 tons from Cape Observation.

According to the statistics of the Fisheries Control, the catch of salmon in the Amur River in 1910 was as follows: Spring salmon, 7,701,344; summer salmon, 21,384,549; autumn salmon, 9,546,254; in all, 38,632,147. Of this number 34,649,025 fish were marketed and the balance consumed locally. Japan bought 23,228,481 fish, valued at \$473,800; the balance was valued at \$681,345. In addition there were 4,766,784 pounds of salmon caviar, valued at an average price of \$0.114 per pound, totaling \$543,413, which brings the total value of the salmon catch and by-products up to \$1,698,558. During the same year, in Peter the Great Bay, 8,263 salmon were caught.

The number of salmon caught in eastern and western Kamchatka and in the bays and rivers in this region not included in the Fishing Convention, and at the Russian river stations, in 1911, was as follows:

Species.	Western Kamchatka.	Eastern Kamchatka.	River stations.	Bays and river outlets.	Total.
Chavitch (king).....	5,421	7,818	207	590	14,036
Keta (chum).....	3,082,300	2,675,000	297,300	890,790	6,945,390
Krasnaia (red).....	2,136,800	747,000	689,000	236,240	3,809,040
Garbusha (humpback).....	39,448,500	1,411,000	1,320,200	175,980	42,355,680
Kishutch (coho).....	327,200	179,000	114,200	7,770	628,170
Total.....	45,000,221	5,019,818	2,420,907	1,311,370	53,752,316

In the Okhotsk district the catch amounted to 827,274 keta and 37,790 krasnaia. Of salmon caviar 489 tons were prepared by the Japanese and 60 tons by the Russians.

In 1915 about 50,000 barrels of pickled salmon were prepared on the Amur River. In the sections covered by the Fishing Convention 6,000,000 salmon, mostly keta with a few krasnaia, were dry-salted, while 80,000,000 humpback salmon, called "salmon trout" in Japan, were so prepared. No fish were frozen for the European market, due to the war. A considerable quantity of caviar was prepared, but the quantity is unknown. The pack of canned salmon is shown elsewhere.

### FREEZING SALMON.

As when the Russians owned Alaska, the exploitation of Siberia was carried on for many years by trading companies with large powers granted by the Government. In 1892 a very enterprising company was in charge, judging from the following extract from a letter written on February 2, 1893, by the late Eugene G. Blackford, the well-known fish dealer of New York, to the late Col. Marshall McDonald, then United States Commissioner of Fish and Fisheries:

I have just learned of the arrival in Chicago of 60,000 pounds of frozen salmon. They were caught in Petropavlovsk, Kamchatka. These fish are a new venture

undertaken by a commercial trading company who control that country, and these salmon have been taken from a river where none have been caught before, and my information is that they catch fish weighing as much as 150 pounds each. The above lot of fish was brought frozen to Tacoma and then shipped by refrigerator car to Chicago where they were sold to Mr. Booth of the Booth Packing Co., Chicago. Mr. Booth has declined to pay for them because of their not being in satisfactory condition.

Nothing further appears to have been done in this line until in 1903, when a Berlin fish merchant outfitted and sent to the Siberian coast a refrigerator steamer with a capacity of 2,500 tons. The fish were caught mainly in the Amur River and were frozen immediately after being brought aboard. In all, 160,000 salmon were obtained, and these were in excellent condition when landed at Hamburg, Germany.

In 1907 the Salmon Steam Fishing Co., a combined British and Japanese company, chartered the steamers *Zenobia* and *Zephyrus*. These vessels were fitted with refrigerating apparatus and cold-storage chambers and sent to the Kamchatkan Peninsula to get a cargo. Both secured good cargoes.

In 1909 two refrigerating steamers visited the coast and froze salmon for the European market. One vessel was outfitted by a British company and the other by a German company, J. Lindenberger (Inc.). The latter reported that the chum salmon, the principal species frozen, were large and very bright. The British steamer left England in April and arrived home again late in December.

#### CANNING SALMON.

In 1900 the Kamchatka Commercial & Industrial Co. (Ltd.), was organized at St. Petersburg, Russia, by A. T. Prozoraf, president of the St. Petersburg Chamber of Commerce, P. M. Grunwalt, H. T. M. Court, and A. A. Prozoraf, secretary. A complete canning outfit was purchased in the United States, and the first cannery in Siberia established at Petropavlovsk, Avacha Bay, Kamchatka.

The San Francisco Trade Journal, under date of December 19, 1902, printed the following item relating to the operations of this cannery:

On December 8 the Russian barkentine *Bitte* arrived from Petropavlovsk, Siberia, with 10,436 cases canned salmon. This is the first consignment of salmon received from them.

The greater part of the pack comprised dog salmon, although they were labeled "pink" salmon, the rest being reds and kings.

In 1903 the company did not operate, the fishing season being devoted to moving the plant to Ust-Kamchatka, at the mouth of the Kamchatka River, where, after being in use altogether for two or three years, it was abandoned and left all standing.

In 1907 two canneries were established in the estuary of the Amur River, near Nikolaievsk, but beyond getting out samples they were never operated.

In 1910 A. G. Denbigh, an Englishman, built a modern cannery near the second site of the Kamchatkan Commercial & Industrial Co. That year the cannery produced only about 10,000 cases, but each year since the equipment of the plant has been enlarged and improved until in 1913 the pack amounted to 60,000 cases. Early in 1914 a complete one-line plant of American can-packing machinery was installed.

In 1912 Mr. Denbigh built another cannery  $1\frac{1}{2}$  miles away from the above plant. This plant was first operated with German and Norwegian sanitary machinery, but in 1914 a two-line American sanitary can-packing plant was installed, the can-making plant at the first plant making all the cans needed at the two canneries.

In 1915 a number of additions were made to both plants in the line of flat fillers, etc., while still more were in contemplation for 1916.

Mr. Denbigh also operates a hand cannery at Compocowa, on the west side of the Kamchatka Peninsula.

Up to 1912 very few canneries, and these very primitive affairs, had been built by the Japanese, owing to the uncertainty of tenure referred to previously. The "canneries" were mere sheds or shelters where the cans—which were brought from Japan, made or half made—were filled, closed, and cooked, furnace-heated, vertical retorts being used for the latter purpose. If the owner lost his concession at the end of the fishing season he simply took his retorts away with him and the buildings were left to his successor.

In 1912 a Tokyo company (Ichigumi & Co.) put up two canneries near the Ozernaya River in Kamchatka, while a Japanese from Niigata, Japan, also put up a small plant in the same vicinity. Both plants were cheaply built and operated with hand-power machinery and small vertical retorts. That year the two companies together packed about 13,500 cases of salmon.

The same season Ichigumi & Co. put up another hand-power cannery, and Tsutsumi & Co., of Hakodate, Japan, built two others of the same type near the Kamchatka River, on the east coast.

In 1913 Tsutsumi & Co. built a modern cannery at Ozernaya and installed a complete line of American sanitary can-making and can-packing machinery.

The same year Ichigumi & Co. put up two hand-power canneries near the Kamchatka River, having succeeded to the concessions formerly held here by Tsutsumi & Co. In 1914 they built a modern plant and installed a complete line of American sanitary can-making and can-packing machinery.

The St. Petersburg firm of S. Grooshetsky & Co., which has been engaged for a number of years in the freezing of salmon and in the preparation of salmon caviar, under the name of the Pacific Ocean Sea Industry Association, erected a cannery near Ozernaya in 1914,

and installed in it a full line of American sanitary can-making and can-packing machinery. This plant will compare favorably with most of our Alaska canneries. The buildings are of iron.

In 1915 a number of extensive improvements in the way of new buildings, machinery, etc., were made to the various plants, and during the winter of 1915-16 several of the canning firms had representatives in this country selecting much additional machinery for use during the 1916 season.

The following table <sup>a</sup> shows the detailed pack of canned salmon made by the various companies operating in Siberia in 1915:

Name and cannery location.	Canneries.	One-pound flats.					Total.
		Reds.	Springs.	Silvers.	Chums. <sup>a</sup>	Hump-backs.	
A. G. Denbigh; Kamchatka River (2) and Compcowa.....	3	<i>Cases.</i> 58,000	<i>Cases.</i> .....	<i>Cases.</i> 26,000	<i>Cases.</i> 38,000	<i>Cases.</i> .....	<i>Cases.</i> 122,000
S. Grooshetsky & Co., Bolsheretsk.....	1	6,000	.....	.....	23,000	.....	29,000
Minard & Co.....	1	.....	.....	.....	7,000	.....	7,000
Nihiro Fishing Co. (Ltd.), Kamchatka River.....	1	14,703	3,334	2,191	11,981	.....	32,209
Sugamiya.....	1	2,200	.....	.....	.....	.....	2,200
Tsutsumi & Co., Ozernaya.....	1	<sup>b</sup> 37,800	.....	.....	8,800	.....	46,600
Hand-pack canneries, East and West Kamchatka.....	2	1,000	.....	.....	4,000	10,000	15,000
Total.....	10	119,703	3,334	28,191	92,781	10,000	254,009

<sup>a</sup> Called "Pinks" in Siberia.

<sup>b</sup> Includes 10,800 cases one-half pound flats of 8 dozen each.

The following table <sup>b</sup> shows the pack of canned salmon in Siberia from 1910, the virtual inception of the industry, to 1915, inclusive:

Years.	Springs.	Reds.	Silvers.	"Pinks." <sup>a</sup>	Hump-backs.	Total.
1910.....	<i>Cases.</i> .....	<i>Cases.</i> 5,500	<i>Cases.</i> 2,500	<i>Cases.</i> 2,000	<i>Cases.</i> .....	<i>Cases.</i> 10,000
1911.....	.....	15,000	6,000	4,000	.....	25,000
1912.....	.....	43,500	18,000	16,000	.....	77,500
1913.....	.....	102,900	7,000	21,000	2,500	133,400
1914.....	.....	85,000	22,500	27,000	2,000	136,500
1915.....	3,334	119,703	28,191	92,781	10,000	254,009
Total.....	3,334	371,603	84,191	162,781	14,500	636,409

<sup>a</sup> Chum salmon are marketed under a "Pink" label.

### SALTING SALMON.

By far the greater part of the salmon catch of Siberia is either pickled or dry-salted. This was the earliest commercial method initiated on the coast and has been followed for a number of years, mainly by the Japanese. The coast is dotted with concessions worked by Japanese, while there are large numbers in operation along the rivers, these being restricted to Russians. An idea of the extent of

<sup>a</sup> From Pacific Fisherman Year Book for 1916, p. 44.

<sup>b</sup> Idem., p. 39.

this branch of the industry may be gathered when it is stated that in 1915 there were 50,000 barrels of pickled salmon prepared in the Amur region, while the Japanese dry-salted about 6,000,000 dog salmon, including also a few reds, and 80,000,000 humpbacks, or "salmon trout," as they are called in Japan.

In pickling salmon the fish are split down the back, the sides being held together by the belly. The roe, gills, and viscera are removed and the fish are then washed, and after salting are placed in large tanks for seven or more days, or until they are thoroughly struck, after which they are packed in barrels, flesh side up, except the two top layers, which have the skin side up. To about 700 pounds of fish 180 pounds of salt are used.

The dry-salting, next to drying, is the most primitive method employed in preserving salmon. The process consists simply in splitting the fish up the belly, removing the gills and entrails, and then filling the belly with salt. The fish are then placed in rows on matting and covered with salt, and other rows are placed on top of them until the pile is from 8 to 10 feet high, when the entire lot is covered with matting and left for about seven days, after which they are relaid and again covered with salt. For shipping the fish are packed in mats.

A very odd feature in connection with the operation of most of the Japanese plants is that the salt to be used in curing the fish is usually dumped loose onto some level spot, with absolutely no covering over it, and exposed to the elements.

The Japanese consume enormous quantities of these dry-salted salmon. During the Russian-Japanese war the latter country's fishermen were cut off from access to their usual fishing grounds, with the result that they were forced to look elsewhere for fish. During 1905 and 1906 large quantities were prepared in Alaska, British Columbia, and Washington for this trade, but as soon as the war ended and the Japanese got access once more to their old fishing grounds, the Japanese duty on salt fish, which had been suspended during and for a short period after the war, was reimposed. As a result our fishermen soon quit the business, and since then operations on this coast have been almost wholly restricted to Japanese operating in British Columbia waters.

At the height of the production on this coast Mr. King, the American consular agent at Hakodate, Japan, made the following suggestions to preparers and shippers of dry-salted salmon for the Japanese trade:

The salmon should arrive in Japan by December 1. Most of these fish are used among the Japanese for New Year's presents. After the new year the price invariably declines 20 to 30 per cent, and for a month or two the fish are difficult to dispose of, as the consumers always stock up before the new year.

The salmon should weigh not less than 5 pounds when thoroughly cured. They should be free from spots, which are usually found on the salmon if caught in fresh or brackish water. No Japanese would think of giving a salmon with red and black spots to a friend for a New Year's present, and spotted fish never realize more than half the price obtainable for clean white fish. The salmon should be split up the belly and should be salted with fine salt. Coarse salt always tears the flesh of the fish when being rubbed in. Care should be taken that the salmon are not oversalted.

Semga salting is a more improved and sanitary method than that of straight pickling and is used when the fish are being prepared for the European market. Selected fish are cut open along the belly and the viscera and gills are carefully removed. In order that the salt may penetrate the flesh more thoroughly, the flesh on the inside is scored several times. The fish are then carefully washed and rubbed with brushes, after which they are kept on ice for 24 hours. The brine is carefully prepared and very strong. When properly struck the fish are repacked into barrels.

"Kolodka" is a very crude and cheap method of salting. The fish are half salted and half dried without being cut open, and are sold at the place where prepared.

The natives prepare a great many salmon for the winter use of themselves and their dogs, the same as do the Alaskan natives. The fish are dried without the use of salt. The product is known as "youkala."

Some salmon bellies are also cut out and salted, although this has never attained to prominence.

Some fresh salmon, as well as salted, are smoked for local consumption.

Barrels, or tierces, for packing salmon are made from cedar, larch, or fir, with a net capacity of 900 to 1,000 pounds of fish, and are bound with wooden and iron hoops.

## VI. THE SALMON FISHERIES OF JAPAN.

Outside of Karafuto (that portion of Sakhalin Island, south of 50° north latitude, which belongs to Japan) and the Kuril Islands, the salmon fisheries of Japan are comparatively small, the principal portion of the immense catches made by Japanese fishermen being along the coasts of Siberia and Karafuto.

All of the five species of salmon found on the American side are to be found in the waters of Sakhalin during the usual spawning periods.

The chum salmon (*O. keta*), which is known in Japan as "sake," and when canned as "pink" salmon, is to be found on Hokkaido Island, running up the various streams for spawning purposes from September to December.

On the same island is to be found also the masu (*O. masou*), a salmon, according to Dr. Jordan,<sup>a</sup> very similar to the humpback, the scales being a little larger, the caudal fin without black spots, and the back usually immaculate. It is fairly abundant in the streams of Hokkaido, the island formerly known as Yezo, and is found nowhere else in the world. The author had an opportunity to examine a dry-salted masu (it might be well to state here that in Japanese masu means "trout") at the fish house of the Royal Fish Co., in Vancouver, British Columbia, in January, 1916. The manager, Mr. Emy, had imported the fish from his own country. Both in size and general appearance it closely resembled a humpback salmon, and when cut open the flesh had the same coloring observable in our humpback. This species, and the true humpback found in more northern waters, especially in Siberia, are dry-salted in immense numbers and are generally marketed under the name of "white trout" or "salmon trout."

In Japan the "red trout" seem to be our rainbow and brook trouts, which were introduced into Japanese waters some years ago. The red salmon (*O. nerka*) is to be found landlocked in Lake Akan in the northern part of the island. It is smaller in size than the sea species. This species has been introduced into the waters of Honshu.

The section of this report devoted to the salmon fisheries of Siberia treats quite fully of the activities of the Japanese in that quarter.

In Sakhalin, or Karafuto, as it is called in Japan, the Japanese have had a rather checkered career. At one time this island belonged to the Chinese Empire. Early in the nineteenth century the southern

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<sup>a</sup> Fishes, by David Starr Jordan. p. 296. N. Y., 1907.



portion was occupied by the Japanese. In 1875 she bartered it to Russia in exchange for some small islands in the Kuril group. As a result of the Russo-Japanese War the southern half, or all that portion south of 50° north latitude, was in 1905 ceded to Japan.

The salmon fisheries of this island are of much importance. For many years the Japanese had a virtual monopoly of them, but very early in the present century the Russians attempted to restrict considerably the activities of the Japanese fishermen, and encouraged her own subjects to compete with them. Many hundreds of Russians and Koreans were encouraged to migrate to the island and engage in its fisheries. Despite these handicaps, the operations of the Japanese fishermen, according to the statistics shown below, do not seem to have suffered.

Years.	Salmon. <sup>a</sup>	Spring salmon.	Total.
	<i>Koku.</i> <sup>b</sup>	<i>Koku.</i> <sup>b</sup>	<i>Koku.</i> <sup>b</sup>
1897.....	8,589	34,246	42,835
1898.....	6,335	11,228	17,563
1899.....	8,379	22,959	31,338
1900.....	7,719	8,797	16,516
1901.....	3,089	12,735	15,824
1902.....			24,726

<sup>a</sup> Species not specified.

<sup>b</sup> Koku equals about 5½ bushels.

Considerable fishing is carried on around the island of Yedorofu, one of the Kuril group. Here are found red (*O. nerka*), silver (*O. kisutch*), and chum salmon (*O. keta*), also either the humpback or Dr. Jordan's masu.

#### CANNING INDUSTRY.

The salmon canning industry in Japan proper was inaugurated by the Hokkaido Colonization Department, a local branch of the Federal Government. For some time this department had operated a fishery school on Hokkaido Island, at which experimental work in the canning of salmon and other fishery products was carried on. This establishment canned considerable salmon during the Russo-Japanese War.

This same department also established a fishery school on Yedorofu Island, one of the Kuril group, which was, in 1908, taken over by Suhara Kakubei, a fisherman and graduate of the school, and used as a salmon cannery.

Some years earlier, however, about 1892 or 1893, Fujino Shirobei started canneries in Shibetsu and Bekkai, Nemuro Province, Hokkaido Island, and a short time later Idzumi Shozo also started a plant at Nemuro. For a number of years these three canneries were the only producers. The plants were quite primitive, the product small, and most of it was consumed by the Japanese Navy. A demand for the product was gradually worked up, however, and as a result there are now a number of small canning plants on Hokkaido

Island proper, the Kuril Islands, and Japanese Sakhalin. Most of these plants devote the major part of their energies to the packing of crab meat, the canning of salmon being in most cases a side issue. A few of the plants have been equipped with machinery, but the large majority are hand-pack plants, employing but a few persons.

Most of these plants pack what is called "white trout," which is really the humpback or masu salmon. In 1912 there were in Hokkaido and adjacent islands 21 canneries which packed 730 cases (48 one-pound flat cans each) of red (*O. nerka*) and 72,770 cases (48 one-pound cans each) of "white trout," a total of 73,500 cases.

On the Japanese portion of Sakhalin Island 4 canneries packed 10,120 cases (48 one-pound cans each) of "white trout" in 1912.

The pack of canned salmon in Japanese territory in recent years has been as follows:

Years.	Hokkaido and Kurils.	Karafuto (Japanese Sakhalin).	Total.
	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>
1912.....	73,500	10,120	83,620
1913.....	46,000	.....	46,000
1914.....	50,450	15,000	65,450
1915 (estimated).....	55,000	15,000	70,000

The following table shows the quantities and value of salmon and trout taken by the Japanese fishermen in certain years:

Years.	Salmon.		Trout.	
	Pounds.	Yen.	Pounds.	Yen.
1902.....	5,722,475	454,662	923,025	121,499
1907.....	9,286,267	892,879	4,500,008	332,316
1912.....	26,438,017	1,594,230	44,038,383	928,513

### FISHERY METHODS.

In Japanese waters salmon are taken by means of trap nets, haul seines, and gill nets.

The haul seines used along the seashore have a length of about 500 fathoms. Each is carried by a boat of 9 feet beam with 30 men, and the right wing, called the "outing wing," is first paid out as the boat heads out from the beach. When the pocket, or bunt, is cast, the boat turns its course toward the right and steers gradually landward, casting the left wing. When the school is encircled the seine is hauled ashore by the seine ropes.

The floating trap net used for salmon is known as "kaku-ami," or square trap net. This consists of a main net and lead. The main net, or heart, is 70 fathoms long, 10 fathoms wide, and 10 fathoms deep,

and the lead is 120 fathoms long. The latter guides the fish toward the main net. When being fished the pot is hauled up by a boat crew and the fish transferred to the boat by means of a dip net.

### FISH CULTURE.

The artificial culture of salmon is carried on in 56 hatcheries, which are distributed in Hokkaido and the prefectures of Aomori, Akita, Yamagata, Niigata, Toyama, Kyoto, Iwate, and Miyagi. Nine of these belong to the government of Hokkaido and other prefectures, while the rest are owned by fishing associations, individuals, or corporations. The number of young salmon distributed by these hatcheries amounts to over 80,000,000 a year.

The largest hatchery is the one at Chitose, under the supervision of the Hokkaido Fishery Experimental Station. It was established in 1887, and it is estimated that the fish distributed by it number from 20,000,000 to 30,000,000 yearly.

The salmon hatchery of Murakami, Niigata prefecture, dates as far back as 1881, when a regulation pertaining to the preservation of young salmon in the River Miomote was enacted by the prefecture of Niigata. This was first called the "Murakami Salmon Raising Plant," but in 1891 it was turned into a hatchery, and is now distributing 2,000,000 young salmon a year. The salmon hatchery of Nitta River, Fukushima prefecture, is very similar in its history and organization to the above.

The industry has during the last few years become very popular in Yamagata prefecture, where 22 hatcheries are in operation as private enterprises.

In the prefectures of Shiga, Miye, Shizuoka, Nagano, Yamanashi, Kanagawa, Akita, Niigata, Hyogo, Miyazaki, and Hokkaido, the masu (*O. masou*) and the landlocked hime-masu (*O. nerka*) are raised and distributed in the lakes and rivers. There are eight hatcheries working on these species. The hatchery of Lake Towada, Akita prefecture, first transplanted hime-masu from Hokkaido in 1902, and it is now hatching from 5,000,000 to 10,000,000 eggs a year for the purpose of distributing the fish among the different districts.

## VII. METHODS OF PREPARING SALMON.

### CANNING.

#### EARLY DAYS OF THE INDUSTRY.

In the salmon industry canning is, and has been almost from the time of the discovery of a feasible method of so preserving the fish, the principal branch. The first canning of salmon on the Pacific coast was on the Sacramento River in 1864, when G. W. and William Hume and Andrew S. Hapgood, operating under the firm name of Hapgood, Hume & Co., started the work on a scow at Washington, Yolo County, Cal. The Hume brothers, who came from Maine originally, had been fishing for salmon in the Sacramento River for some years before the idea of canning the fish had entered their minds, while Mr. Hapgood had previously been engaged in canning lobsters in Maine, and was induced by the Humes to participate in order that they might have the benefit of his knowledge of canning methods. The late R. D. Hume, who worked in the original cannery, and later became one of the best-known cannerymen on the coast, thus describes the plant and the methods employed: <sup>a</sup>

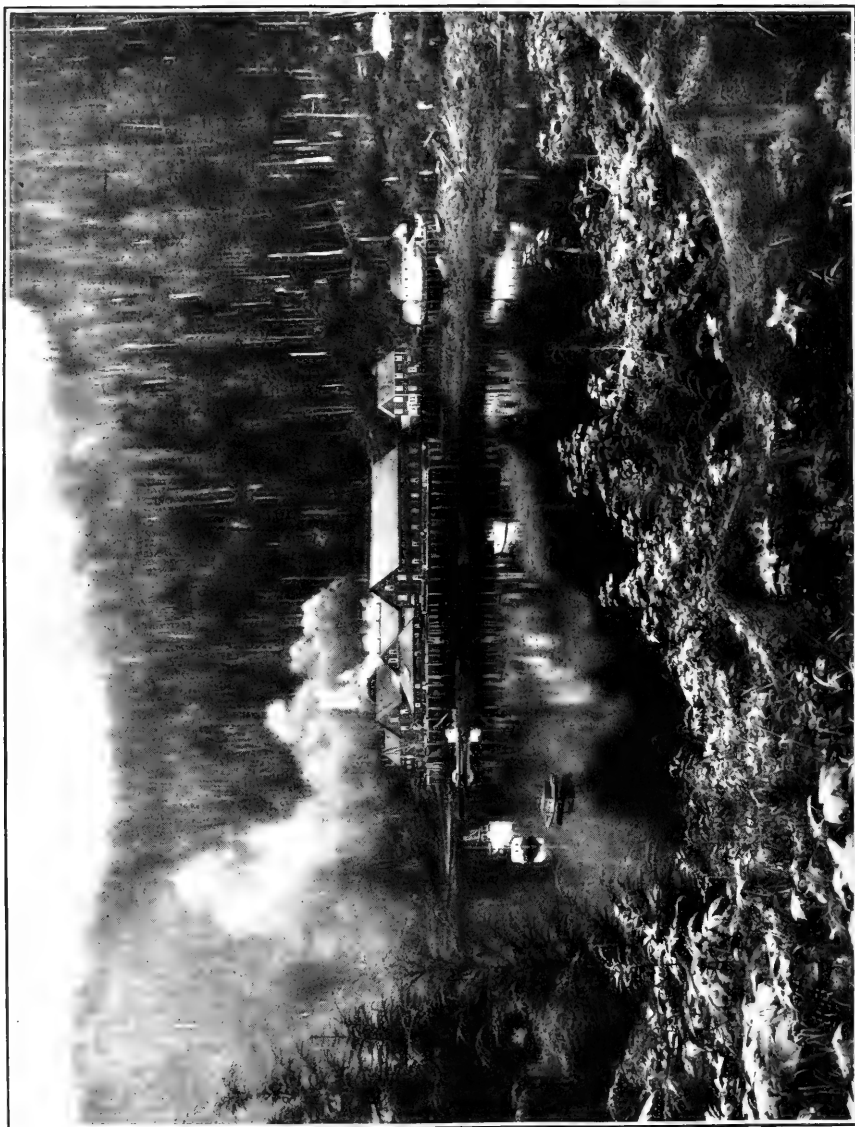
Before the arrival of Mr. Hapgood [from Maine] the Hume brothers had purchased a large scow, on which they proposed to do the canning of salmon, and had added an extension to the cabin 18 by 24 feet in area, to be used as a can-making shop. This had a shed on the side next to the river for holding any cans that might be made in advance of the packing season. A few days after the arrival of Mr. Hapgood [March 23, 1864], the tools and machinery were packed and put in position. Mr. Hapgood made some stovepipe and two or three sheet-iron fire pots, and in a short time was ready for can making. The following list of tools and machinery will show how primitive our facilities were as compared with present methods: 1 screw hand press, 1 set cast-iron top dies, 1 set cast-iron bottom dies, 1 pair squaring shears, 1 pair rotary shears, 1 pair bench shears, 1 pair hand shears or snips, 1 pair 24-inch rolls, 1 anvil (weight 50 pounds), 1 forging hammer, 1 tinner's hammer, 1 set punches for making stovepipe, 1 rivet set, 1 grooving set, 2 iron slabs grooved on one side to mold strips of solder, 1 iron clamp to hold bodies of cans while soldering the seams, 1 triangular piece of cast iron about three-eighths of an inch in thickness and 6 inches in length, with a wooden handle attached to the apex, also used for holding can bodies in place while being seamed.

The process of canning was as follows: The bodies of the cans were first cut to proper size by the squaring shears, a line was then scribed with a gage about three-sixteenths of an inch from one edge, and they were next formed into cylindrical shape by the rolls. They were then taken to the soldering bench and one edge lapped by the other until

<sup>a</sup> The first salmon cannery. By R. D. Hume. *Pacific Fisherman*, vol. II, no. 1, January, 1904, p. 19-21.



CANNERY, HOONAH, ALASKA.



CANNERY, SANTA ANA, ALASKA.

the edge met the line that had been scribed and fastened there by being soldered a small part of the length to hold them in place for the further purpose of seaming. They were then placed either in the iron clamp, which had a piece of wood attached to its under side, and held firmly, the clamp being closed by the operation of a treadle, or were slipped on a piece of wood, which was bolted to the bench, while being held in place by the triangular hand seamer, which was pressed down on the lap of the seam by the left hand of the operator. When this had been done a piece of solder, which had been prepared by shaking in a can together with rosin, was placed on the seam and melted and rubbed lengthwise of the seam. After cooling the bodies were ready for the end or bottom, which operation was brought about by first cutting out circular blanks with the rotary shears, and then placing them in the cast-iron die and bringing the handle of the screw press around with a swing with force enough to form up the end or bottom. In this operation there were many difficulties, as the ends or bottoms would many times stick to the upper part of the die and refuse to come off, and finger nails were pretty short in those days. To get the ends out of the lower part of the die was not so bad, as a wooden plunger operated by a treadle knocked them out, but sometimes they were in pretty bad shape. When the bottoms or ends were ready they were slipped on the bodies and the edge of the bottom rolled about in a pan of powdered rosin until the seam was well dusted. A piece of solder similar in size and preparation as used for the side seam was placed in the can. It was then placed on the smooth side of the cast-iron slabs, and the operator, with a hot soldering copper shaped to fit the circle of the can, melted the solder and by turning the can rapidly soldered the full circumference. The output of this can factory was very imperfect, as at least one-half of the seams burst, owing to the lack of experience of the manager or want of good judgment.

When the can making was well underway Mr. Hapgood then turned his attention to getting the apparatus for canning on board the house-boat. This in the cooking department consisted of a kettle made of boiler iron about 36 inches in diameter and 5 feet in depth, set in a brick furnace and fired from underneath. Alongside was a round-bottom, cast-iron pot holding about 60 gallons of water and heated in the same manner. These kettles, with a dozen coolers or circular sheet-iron pans with ropes attached and with holes cut in the bottoms for drainage, a set of 5-inch blocks and tackle, with a sheet-iron fire pot and a scratch awl, completed the bathroom outfit. The can filling and soldering room was furnished with a table through the center, where cutting the salmon in pieces to suit and the filling of the cans was done. On each side of the room there was a bench running the full length, on the end of one of which the cans were placed to receive the pickle, which was used at that time instead of the small quantity of salt that is placed in the cans during the operations of these later days. After the salmon had been cleaned by removing the entrails and washing them outside the covered portion of the scow, they were brought inside and placed on the table, and a man with a butcher knife in one hand and a stick in the other, which had a mark showing the length of the pieces desired, cut gashes in the side of the salmon as a guide and then cut the fish into sections corresponding to the length of the mark on the stick. He then proceeded to cut the sections in pieces to suit the cans. Then three or four operators placed the salmons in the cans and shoved them along the table to where a boy wiped the top edge and passed them along to two others who placed tops which fitted inside of the rim. The cans were then taken in wooden trays to the bench opposite the starting point, which was fitted with four sheet-iron pots, and at the one nearest the entrance to the house on the scow a man put a soldering flux on the top edge, which was made by adding zinc to muriatic acid, and then with a pointed soldering copper and a stick of solder melted the solder until a small portion could be drawn around the groove formed by the edge of the can and the bevel of the top. From there the cans were taken to the other parts of the bench, where two men finished soldering the head in, and then taken to the third man, who soldered, or, as it

was called, buttoned, the end of the seam lap. The cooking department or bathroom, as it was called, was separated from the filling and soldering room by a partition. The cans were shoved through a hole in the partition.

At this time the process was a secret. Mr. Hapgood did the cooking and all the work done inside, no one but a member of the firm being allowed to go in. This privacy was continued until the firm moved to the Columbia River and, the labor becoming too arduous for Mr. Hapgood to perform alone, a boy by the name of Charlie Taylor was taken in as an assistant. \* \* \*

But to return to the original proposition: When the filled cans had been soldered and entered the bathroom they were put in the coolers and lowered into the cast-iron pot, one cooler of cans being cooked at a time. The cooler was lowered into the boiling fresh water until the cans were submerged to within 1 inch of the top ends and left to cook for one hour; then they were hoisted out and the vent holes in the center of the top soldered up, after which they were dumped into the boiler-iron kettle, which held a solution of salt and water of density sufficient to produce, when boiling, a heat of 228° to 230° F. They were cooked in this solution for one hour and then taken out of the kettle with an iron scoop shaped like a dip net, with a wooden handle about 6 feet in length. They were dumped into a tank of water on the other side of the partition which separated the bathroom from the packing room through an opening in the partition, receiving many a bump and bruise in the operation. Then they were washed with soap and rag to remove the dirt and grease, each can being handled separately. When this was done they were piled on the floor of the packing room and in a few days were painted with a mixture of red lead, turpentine, and linseed oil, for at that time buyers would have no canned salmon, no matter how good the quality, unless the cans were painted red.

When packs of 10,000 to 15,000 cases were made in a season only the absolutely essential machinery was used, the rest of the work, such as cutting and cleaning the fish and placing them in the cans, being done by hand. When larger canneries were constructed, especially in Alaska, where labor is expensive and difficult to obtain, the greater part of the workmen having to be brought up from the States, machinery to do as much as possible of the work became absolutely essential. The inventive genius of the country came to the rescue and one by one machines for cutting, sliming, and cleaning the fish, filling the cans, putting the tops on, and washing them were invented and put into use, while automatic weighing machines were produced and extensive improvements and alterations were made in the machines previously in use. There are to-day many large manufacturing establishments which devote all or the greater part of their facilities to furnishing machinery and supplies to this giant branch of the salmon industry.

When salmon canning was in its infancy a pack of from 150 to 200 cases was considered a good day's work. Now it is not an uncommon occurrence for a cannery to turn out from 2,500 to 4,000 cases in one day, and there are a number which have even greater capacity.

During the height of the salmon run, a cannery is an exceedingly busy and interesting place, and a description of the methods used at the present time will show the giant strides the industry has made since the days of Hapgood, Hume & Co.



## HANDLING THE SALMON.

At convenient spots near the fishing grounds large scows and lighters are anchored and the fishing crews deliver their catches aboard these, the tallyman on each scow keeping a record and giving the crew a receipt. Men fishing near the cannery deliver their catch alongside. Steamers and launches are used to tow out empty scows and bring in those filled. In the old days the fish were pitched by hand into bins on the wharves, but this laborious method has been superseded by the use of an elevator, which extends from a short distance above the top of the wharf to the water's edge, provision being made for raising or lowering the lower end according to the stage of the tide. This elevator is slanting, and is made of an endless chain operating in a shallow trough. About every 2 feet there is attached to the chain a crosspiece of wood. At the top of the elevator are chutes which deliver the fish at various convenient spots on the cutting-room floor.

At a few places tracks have been run down to the low-water stage and the steamers, launches, and scows come alongside. Small cars are run down to the vessels, to be filled by men pitching the fish from the boats, and the cars when filled are run up to the cutting room and dumped upon the floor. At other places men armed with pews (single-tined forks) pitch the fish up to the wharf, where other men pitch them to the cutters.

If the salmon have been in the scows from 20 to 24 hours they are used as soon as possible after being delivered at the cannery; otherwise that length of time is usually allowed to elapse, the cannerymen claiming that if not allowed to shrink the fish will be in such condition that when packed much juice will be formed, so that in "blowing," after cooking in the old-style method, light-weight cans will be produced.

Before dressing the fish a stream of water is kept playing over them in order to remove the dirt and slime, after which men with pews separate the different species into piles convenient to the dressing tables.

## DRESSING.

A number of the small canneries still use the old hand method of dressing the fish, and in such places the selection of the butchering or dressing gangs is of prime importance. Two men constitute a "butcher's gang," and the number of these gangs is dependent upon the output of the plant. Boys place the fish, with the head out, upon the cutting tables. One man cuts off the heads, and is followed by another who removes the fins, tails, and viscera. The offal is thrown into a chute, whence it passes into the water under the cannery

or into a scow moored underneath, while the dressed fish is transferred to a tank of water, to be scaled, washed, and scraped. It is then passed to another tank of water, where it receives a second washing, scraping, and final brushing with a whisklike broom, which removes any offal, blood, and scales that were overlooked in the first washing, after which it is removed to large bins on either side of the cutting machine.

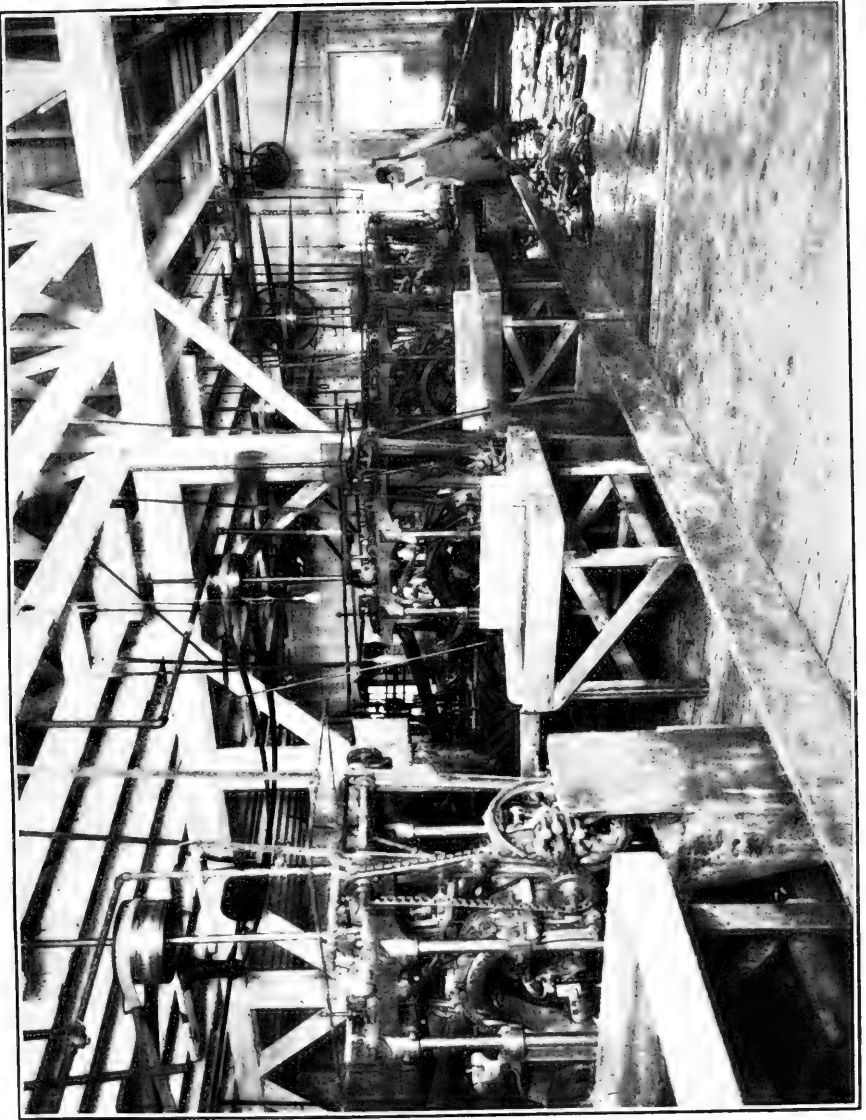
The most useful cannery inventions in recent years have been of machines for doing the work of the dressing gangs. Several have been invented and work more or less satisfactory. The one commonly known as the "Iron Chink," now in general use in canneries where such machines are employed, was first used in 1903 at Fairhaven (now Bellingham), Wash. It removes the head, tail, and fins and opens and thoroughly cleans the fish ready to cut into pieces for the cans. By the use of these machines the dressing gang is almost entirely done away with, dispensing with 15 to 20 men. This same machine is now so arranged that the fish after dressing are also "slimed"; i. e., the thick mucus covering the skin removed.

#### CUTTING.

The usual method of cutting the salmon is by a machine. This is generally a large wooden cylindrical carrier, elliptical in shape, thus having a larger carrying capacity. Ledges or rests on the outside the length of the carrier are wide enough to hold the fish, and are slit in cross section through the ledges and outer casing to receive the gang knives. The latter are circular, fixed on an axle at the proper distances apart, and revolve at the highest point reached by the carrier and independently of the latter. The carrier and gang knives are set in motion, each revolving on its own shaft. As a rest on the carrier comes to a horizontal position, men stationed at the fish bins lay a fish on each ledge as it passes. Thence it is conveyed to the revolving gang knives and, after being divided, passes through on the downward course, sliding off the rest into the filling chute. The knives in these machines are so arranged as to cut the fish transversely in sections the exact length of the cans to be filled.

The rotary cutter shunts the tail pieces to one side, and these are carried by means of a chute to baskets. The tail pieces are canned separately. As the tail portion is much smaller, with less meat, it can not be placed in the cans with the middle and head sections without detracting from their value, but if packed under a distinct and separate label, as is now done, there is no reason why the tails should not supply the demand for a cheap grade of fish.

In some of the smaller canneries, especially in those packing flat cans, the gang knives are worked by hand. In this case the knives are not circular, but elongated or semicircular in shape, tapering at



A BATTERY OF "IRON CHINKS."



CUTTING SALMON INTO PIECES TO FIT THE CANS.

the outer ends. They are mounted on an axle having a large iron lever at one end, and when this lever is raised the ends of the gang knives are thrown up and back. The fish is then placed in position under them and the lever pulled forward, the knives, with a scimitar-like movement, dividing the fish.

The original method of cutting was by means of a long knife wielded by a Chinaman who stood at a regular butcher's block. Although his strokes were incredibly quick, the rotary cutting machine is a vast improvement over the old way.

#### SALTING.

Every can of salmon is seasoned with one-fourth of an ounce of salt, which, to insure uniformity, is added by mechanical means. A table is used, in the top of which are holes equal distances apart. On the underside of the top is a sheet-iron plate, with an equal number of holes, which slides in a groove at the sides, and is worked either by a hand or foot lever. Just below is an open space large enough to accommodate a tray holding 36 or 48 cans. A workman stands in front of the table and slides a tray of cans into the open space. He then throws a quantity of salt upon the table and immediately scrapes this off with a thin piece of wood, each hole being filled in the operation, and the salt being prevented from falling through by the iron plate underneath. The lever is then pressed, the iron plate moves forward until the holes in it are directly under the table top, when the salt drops through into the cans. This operation can be repeated four or five times in a minute. Some canneries now use a small salter attached to the filling machine and this deposits the required amount of salt in the can as it is passing by on its way to be filled.

#### FILLING THE CANS.

Most canneries now use filling machines, although a few, more particularly those packing flat and odd-sized cans, still fill by hand.

The filling machine consists of a chute with a belt to which are attached wire racks about 4 inches apart, set at an angle to prevent the salt from spilling out, into which the salted cans are fed from the floor above and pass into the machine. At the same time the divided sections of salmon pass down another chute into the mouth of what looks like a hand coffee mill. They pass through here down a smaller chute and are forced by two dogs into a receptacle through which the plunger, or filler, passes. Here the plunger comes opposite the open mouth of the empty can, which when it reaches this point is caught by a clasp or hook and held in front of the plunger, which is immediately thrust forward through a chamber filled with salmon, cutting the fish longitudinally and at the same time filling the can.

The next movement forces the can out upon a table. When running at full speed, one of these machines will fill about 80 cans a minute.

On being released by the clamp the cans roll upon a long table and are picked up by a man stationed here, who strikes each one upon a square piece of lead set in the table, in order to settle the contents down into the can and for the purpose of detecting any deficiency in weight. If not quite full the cans are pushed to the other side of the table, where a woman or man adds the quantity of fish needed, a supply of small pieces being kept at hand for this purpose. Generally the cans overrun in weight, frequently as much as an ounce. Occasionally a can is weighed in order to see that the machine is in perfect adjustment. In many canneries weighing machines are arranged in the "line" and these throw out the short weight cans.

In the hand method the fillers stand on each side of a long table with a trough running down the middle from end to end. This is filled with the cut pieces of salmon, and the fillers, usually women and children, put into the cans large pieces at first and then smaller pieces to occupy the vacant spaces.

#### WASHING THE CANS.

In the old style method the cans are put upon an endless belt by a workman and pass from the filling-machine table to the washing machine. This is a rotating apparatus, consisting of an iron framework holding 10 rests or stands on which the cans sit. Immediately overhead are small perpendicular shafts with an iron cap, the diameter of a can, fixed to the end of each. Each can as it reaches the machine is caught by one of the washers and the cap brought down over the top, a tight-fitting flange preventing water from getting inside. Revolving rapidly as it goes, with a stream of water against it of sufficient force to remove the dirt and grease, the can is carried until the machine has revolved 180 degrees, when it is released and passes out on a belt. A more modern method is to use jets of steam for washing, while one of the latest devices is to clean the cans by a cold-air blast which strikes directly on the top edge. A set of brushes against which the cans revolve is used in a few canneries.

After being washed the cans continue on an endless belt and pass two children whose duty is to put a small piece of scrap tin on the top of each. These pieces are called "chips," are from 1½ to 2 inches, and are scraps from the sheet tin used in making the tops of the cans. The shape is of no particular importance so long as the pieces are long enough to cover the hole in the top of the can, or the cap as it is called.

## CAPPING.

The endless belt delivers the can to the capping or topping machine. On reaching this the can passes under a cap holding a top, the latter being fed in through a separate aperture, and the cap immediately falls with just sufficient force to put the top on the can without injuring either. The can is then forced out from under the capper by the rotation of the machine, and the next capper is brought around to receive another can. As the cans revolve they are carried under a crimper, situated directly opposite the capper, which presses the edge firmly around the body. While one can is being topped another is being crimped, after which it rolls out upon a belt on its side, and is taken through the acid trough. Before the tops are sealed the edges must be treated with a solution of muriatic acid, which is in a glass receptacle and is applied just before the cans are rolled through the acid trough on the endless belt.

## SOLDERING.

For many years the tops and also all other parts of a can were soldered by hand, a long, tedious, and expensive process, which eventually gave way to the soldering machine. This is composed of an endless chain about 6 feet long, revolving around two shafts at either end of an iron trough. In the bottom of the trough is the solder, which is kept at molten heat by a row of oil blast jets underneath. Between the lower part of the chain and trough is just enough room for the cans to pass without jamming, and they are forced along the trough by a chain in contact with their sides. They enter the trough at an angle, their bottoms slightly inclined, which causes the top rim to be submerged in solder, thus distributing it evenly all around the edge.

In passing through the trough the cans make about half a dozen revolutions, which cause the tops to become very hot, and it is to prevent them from being blown off by the pressure of the steam which quickly generates that the center hole in the top is made. The "chip" previously mentioned prevents the hole from being choked with salmon.

A soldering machine having, instead of the endless chain to give motion to the cans, a metal spiral running the length of the machine and revolving on an axle through the center, is used in some canneries. Each loop grasps a can and follows it to the end, thus giving the cans the proper motion and preventing them from rolling side by side and lapping the solder over the ends, as is frequently the case with the chain machines.

A few canneries use a revolving cooler, which has a disk upon which the cans rest. This disk is filled with running water, and

after it makes two revolutions the cans are forced into an inclined trough under a stream of water. The usual method, however, is for the cans on leaving the soldering machine to pass under several jets of water to set the solder and at the end of the belt to be transferred by workmen to coolers or crates, which are made of flat strap iron, square shaped, and holding about 96 cans. The cooler having been filled, it is placed upon a square truck and rolled aside, where the vent holes are stopped with a drop of solder.

#### TESTING.

The testing tank is a square wooden tank filled with water heated almost to the boiling point by steam pipes arranged in a coil at the bottom. The coolers are hoisted into the test tank by a block and tackle attached to an overhead track, which permits them to be swung to any place desired.

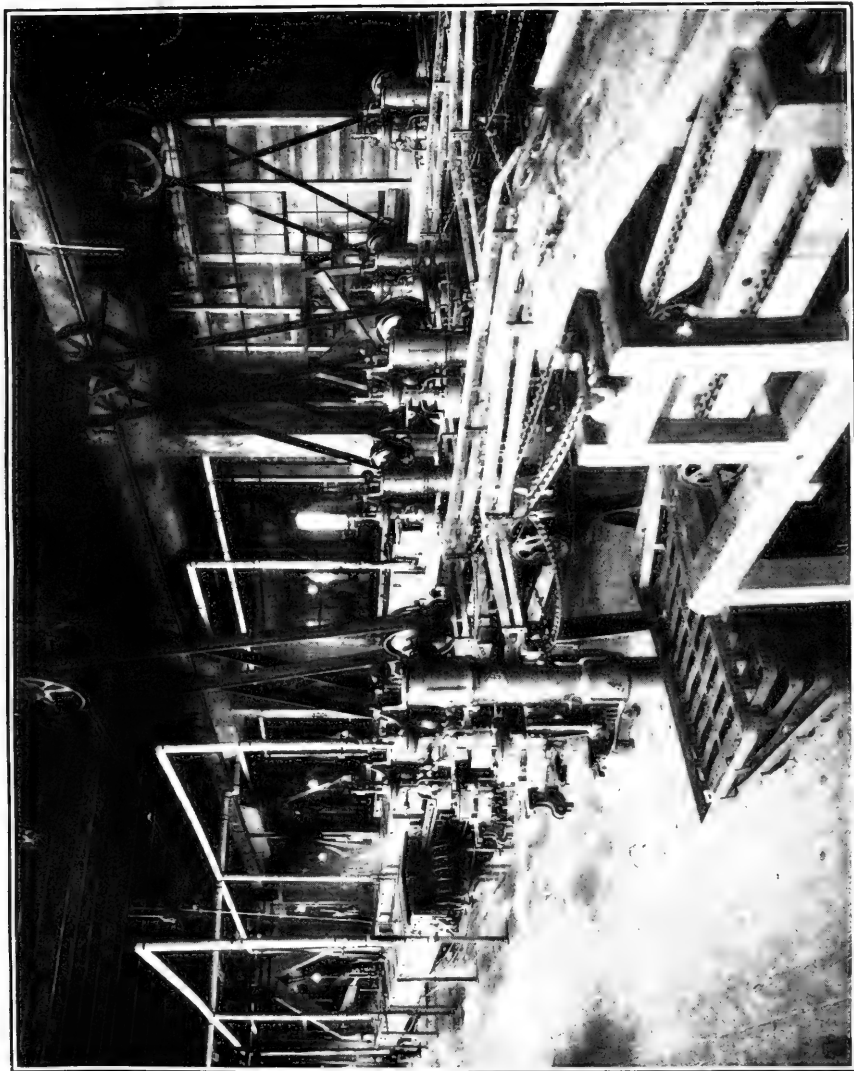
This test is for the purpose of detecting leaks due to imperfect soldering and is conducted by two workmen skilled in this operation. The slightest leak is detected by the appearance of small bubbles issuing from the cans. The spots where the bubbles appear are marked with a small iron tool held in the hand, and the cans are taken out and placed in small wooden trays, in which they are carried to the bench men, whose duty it is to mend them. Cans that have been mended are again tested as before. The bench men are located in front of a long bench on which are numerous fire pots, supplied with oil and air led through small tubes, in which the soldering irons are kept heated, the heat and air being regulated by connecting valves. Kerosene oil and gasoline are the fuels generally used now.

#### COOKING.

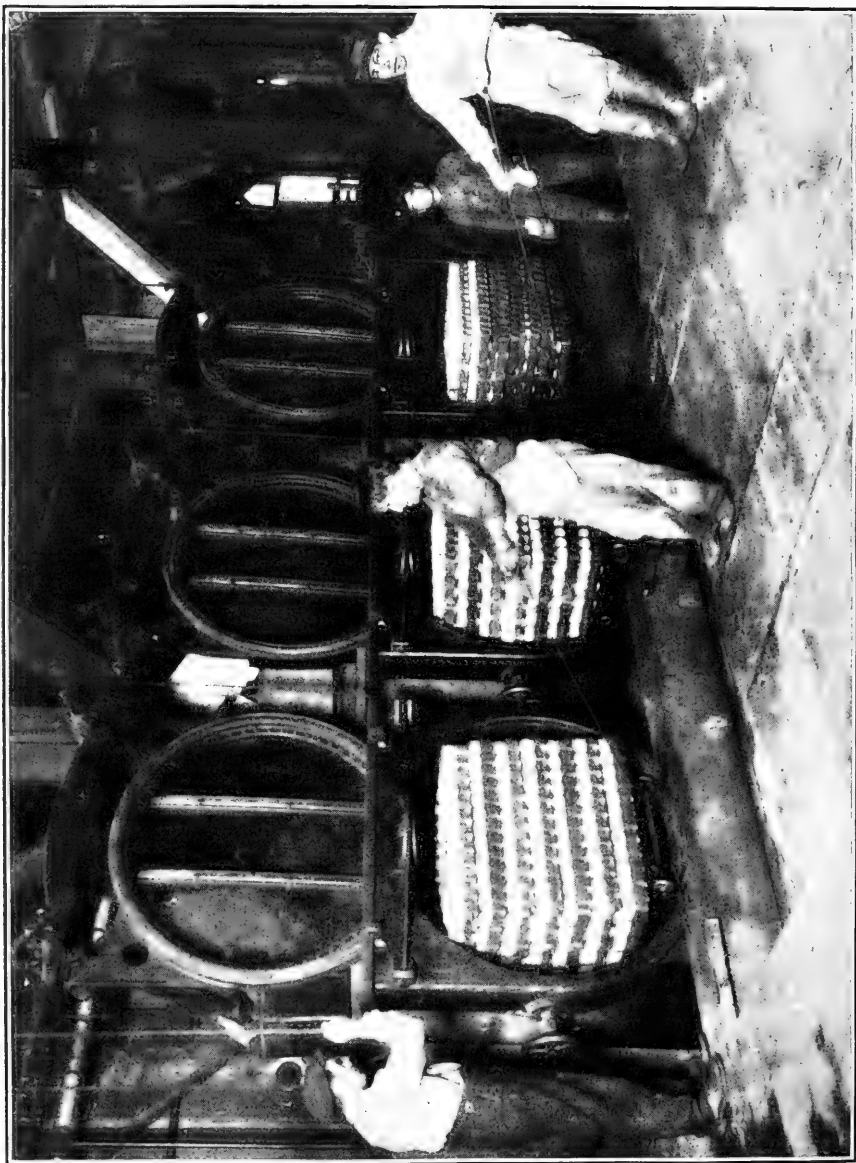
The salmon are invariably cooked in rectangular retorts which rest in a bed and have a track running the long way. In front of each is a turntable for the purpose of receiving trucks coming from any direction. Four trucks, each holding 6 coolers of cans, piled one upon another, are run into the retort, which is then closed and steam turned on, entering at the bottom. The amount of pressure is from 6 to 12 pounds, the heat 250° F. In most establishments the first cooking is continued about 60 minutes.

After the first cooking the coolers are taken out and placed on a long table called a "venting table," where the cans are pricked with a wooden-headed hammer fitted with a small brad, to allow the steam and superfluous water to escape. After the venting has been done the holes are soldered up, the coolers again loaded on a truck and rolled into the second retort, where they are subjected to the same pressure of steam and heat as in the first cooking and for a period of about 60 minutes.





EXHAUST BOXES AND THE DOUBLE SEAMERS.



COOKING THE SALMON IN RETORTS.

In some canneries the retorts for first cooking are made of heavy plank, well bolted to resist the steam pressure.

In the early days much secrecy and mystery was thrown about the cooking, and the work was carried on in a separate room, known as the "bathroom," under lock and key. The first cooking was done in common tubs. The early retorts were made of wood. Later, round iron kettles were substituted, nearly one-half consisting of cover, and round crates were used for holding the cans.

For many years cannery men believed that the double cooking of salmon was absolutely necessary, but in 1898 F. A. Seufert, at his cannery on the Columbia River, at Seuferts, Oreg., a short distance above The Dalles, discarded this idea, and has since used a one-cooking method. By the new process the cans are tested for leaks after the center hole in the top is soldered up, as before, and are left in the retort 70 minutes at 245° F. and 12 pounds steam pressure. According to its originator, this method saves more than one-half the labor in the bathroom, saves nearly one-half the labor in washing the cans after cooking, and also better retains the color of the fish.

#### SANITARY CANS.

A comparatively recent improvement in the salmon-canning business, and one which accomplishes the same purpose as the single cooking in retorts, is that of "sanitary cans," so called. These cans are now used by the majority of the salmon canneries. In order to use these cans a quite radical, but economical, change in machinery is necessary. As the cans leave the filling machine they pass to the clinching machine, which attaches the top of the can loosely to the body in such a way that it allows the gas in the can to escape, yet prevents the fish from coming in direct contact with the steam of the exhaust box. In this way the condensed steam which accumulates in the exhaust box is kept from entering the can, thus keeping water out of the can. This overcomes the difficulty caused by the bleaching of the fish.

The cans then pass into a steam exhauster, consisting in one type of a box about 30 feet in length, in which are three endless-chain belts running side by side. Under and over each belt are steam coils, and under each of the lower coils are single pipes, which through small holes throw jets of live steam upon the coils, creating an intense heat. The cans pass along the first belt, are then transferred to the second belt, on which they return to the entrance of the box, whence they pass to the third belt, and continuing along this to the end pass out to the topper and crimper, the whole operation occupying from 5 to 15 minutes' time. One style of exhauster has 10 ovals formed by the pipe, and the cans pass along these from side to side of the exhauster until discharged at the far end. Upright ex-

hausters, in which the cans travel along a spiral, are also in use. By this means the contents of the can are heated and the greater part of the air exhausted, which is the object of the first cooking in the retort under the method formerly in general use.

A recent invention, which the inventor claims will do away with the steam exhaust box, and thus save a large amount of valuable floor space in the canning "line," is the power vacuum pump, known as vacuum exhausting machine, by means of which air is exhausted from the cans, accomplishing the same purpose as the steam exhaust box. Some of these machines have been in active use for several seasons, with most satisfactory results.

Leaving the exhauster the cans pass to the double seamer, which fastens the cover on tightly with a double seam or crimp. It should be stated that no solder is used in attaching the top on the can, the curled flanges of the cover being coated around the outer edge with cement or other sealing fluid to take its place. Solder, however, is used in joining the side seam of the can, this being done when the can is manufactured. The cans then leave the machine on an endless conveyer and pass to the men who transfer them to the coolers, and these are immediately placed upon the trucks and run into the retort for the one cooking they are to receive. The time they are to remain here is somewhat variable, 70 to 125 minutes with a temperature of 242° F. being the common period.

By the use of these cans the soldering machine is done away with. It also does away with the first cooking and the subsequent venting and soldering, a saving both in labor and time consumed.

#### REPAIRING CANS.

Imperfect cans which are repaired before the first cooking are naturally in the same condition as if there had been no defects. If the leaks are discovered after cooking and are repaired at once and the contents recooked, they are still very good, the only difficulty being that by blowing or venting them a second time they lose weight. The above goods usually go in with the regular pack of their kind and are not classed as regular "do-overs."

When, however, a cannery is running at full capacity, defective cans can not always be repaired and recooked at once and are sometimes set aside for days. Decomposition follows, of course, as with any other meat that is exposed to the air, and the fish becomes unfit for food. When recooked the meat becomes mushy and the blowing or venting makes the cans very light, a defect which is frequently corrected by adding salt water. This, the "do-over," is the lowest class of goods. In the old days, and even yet to some extent, such cans are sold without labels to brokers, or else are given some indefinite label, and sold in the lumber, mining, or negro districts, or



FILLED SALMON CANS COOLING.



FIG. 1.—SALMON ON THE FLOOR OF THE CANNERY DRESS HOUSE.



FIG. 2.—SALMON CAN-LABELING MACHINE:

shipped to foreign countries with less fastidious tastes in the matter of salmon. In 1910 one of the leading companies of Alaska adopted the policy of throwing overboard all "do-overs."

On coming from the second retort the coolers are lowered into a bath of lye, or, as in some canneries, the cans are run through such a bath on an endless belt, which, with the aid of a slight rinsing and a few rubs with a brush over the top, removes from the can all the grease and other material. The belt then passes them into another bath where the lye is washed off in hot fresh water. The cans then go to the cooling room, where a stream of water is played upon them, or, during rainy weather are placed out of doors upon the wharf, and there allowed to cool.

The top and bottom of the cans contract in cooling, and for several hours a sharp popping noise is heard. Here, as in nearly every process through which they pass, the cans are again tested, this time by tapping the tops with a small piece of iron about 6 inches long, or, sometimes, a 12-penny nail. The sound conveys to the ear of the tester an unmistakable meaning as to the condition of the can, and the faulty cans that escape notice during the other tests are almost invariably found in this one.

#### LACQUERING.

An almost universal custom in the salmon-canning industry, but one that is not common in the canning of vegetables, fruits, etc., is that of lacquering the cans. This idea of protecting the can on the outside has been followed from the very beginning, for two reasons: (1) That the English market which, at that time especially, absorbed the greater part of these goods, insisted on their shipments being finished in this way, and (2) from the fact, as these canners speedily found out, that if they did not protect their cans in some way enormous losses through rust would ensue.

The first experiment of this nature was to paint the cans by hand with red paint, treating each singly. Next a composition of logwood extract and alcohol was tried, which, however, did not produce satisfactory results for a very plain reason—the can was dyed instead of being lacquered. The next attempt was to varnish the cans with a japan varnish reduced with alcohol, but this was found to dry too slowly for speedy handling. After extended experimentation the quick-drying brown lacquer of the present time was evolved, which carries asphaltum in the form of an asphalt varnish as its base, this being supplanted in some cases by gilsonite. This lacquer can be procured in either a heavy or light body, is generally reduced with benzine or gasoline, and is applied according to the requirements of the market, which in some localities demands a heavy coating and in



others a much lighter finish, the latter giving a rich golden brown color. Some experiments have also been made in using brighter colored lacquers for this work. Several of these, made to give a bright golden, copper, or other color, are extremely attractive in appearance, while at the same time protecting the tin against rust quite as well as the brown.

The industry soon outgrew the hand method of lacquering, and the process, which for a number of years was universal in the trade and is still used by some canneries, succeeded it. For this there are a number of rectangular box vats about 40 by 80 inches and 18 inches in depth, the number varying with the capacity of the cannery. These are usually lined with galvanized metal and provided with a grid-iron-shaped iron frame, hung from a windlass or other tackle for lifting or lowering from top to bottom of the vat. The cans are loaded on this gridiron, being placed in an inclined position to allow the draining of the lacquer, and are lowered in the vat sufficiently to submerge them in the lacquer with which the vat is charged to a depth of 7 to 10 inches. The loaded gridiron is then raised to the top of the vat and the cans allowed to drain and dry before piling. This method, while being more effective in regard to the volume of work, was still of necessity a very slow and tedious operation. In damp or rainy weather, especially when it is not possible to open warehouse doors and windows, the gas arising from a number of these vats makes effective drying almost impossible.

Another principal objection to this method of lacquering, which applied also to all earlier attempts, was the impossibility of obtaining an even coat of lacquer when the can was allowed to dry in any stationary position. There was also a large waste by evaporation.

Notwithstanding repeated efforts at invention, however, it was not until 1901 that an effective machine for handling this difficult work was put on the market. The apparatus now in use by a number of canneries receives the cans on a revolving wheel fitted with rests for holding them while passing through the lacquer bath. From here they roll upon an endless chain which revolves the cans as they pass through a long box in which a hot blast dries them before they reach the end of the machine. The rotating or rolling motion given to the can after the lacquer bath, preventing the lacquer from draining to and consequently accumulating on any part of its surface, also has the effect of distributing the lacquer evenly and results in a clean and neatly finished can. The air blast facilitates the work of drying to such an extent that it requires only about two minutes after being deposited on the drying bed of the machine for the cans to be ready for handling, while the quantity of cans which can be handled in a day is vastly greater than by the old method.



A few flat and oval cans are not lacquered, but are protected from rust by wrapping in tissue paper, over which the label is placed.

#### LABELING.

While machines have been made for this purpose, and many of them are in use, the work is frequently done by hand. A number of men or women seat themselves about 4 feet apart in front of the pile of cans. Each man has in front of him a package of several hundred labels, and by bunching them on a slant so that successive margins protrude beyond each preceding, he can apply paste to the entire number with one stroke of the brush. A can is placed on the label, is quickly rolled, and the label is on much quicker than one can tell it. Each man places to his right the cans he labels, forming a pile of length and width equal to his unlabeled pile, and when the entire lot has been labeled it has been shifted only about 4 feet. Cans of fancy brands of salmon put up on the Columbia River and in the Puget Sound region are wrapped in colored tissue paper before the label is put on. Cartons similar to those used by the sardine packers would make good containers for fancy brands and would be much cheaper than the present method.

Several attempts have been made to popularize salmon packed in glass and porcelain jars, and while these have met with some favor, it was not sufficient to warrant a continuance of the practice for any length of time. But few are being so packed at the present time.

#### BRANDS.

A very important feature of the canning industry is the selection of appropriate brands or labels for the various grades of salmon. Each company has a number of these, which it has acquired either by designing them or by absorbing another company which owned them. A well-known brand has a value in itself and sometimes is a very important asset. A company will sometimes market a considerable part of its product in one section, and here, where the consumer has become familiar with the brand and pleased with the contents of the can, he will ask for and accept no other, despite the fact that the latter might be, and probably is, the equal of the product he has been using.

For many years but few salmon canners appreciated the value of a can label, and it has taken some bitter experiences to drive home to the rest that a properly designed label placed upon good goods and the owner protected in its use by the law, has real value, just as much as boats, nets, buildings, machinery, or the thousand and one material things required to carry on the business.

A free trade definition of a label would be that it is an artistic representation or intellectual production, stamped directly upon an

article of manufacture, or upon a slip or piece of paper or other material, to be attached in any manner to manufactured articles, to bottles, boxes, and packages containing them, to indicate the contents of the package, the name of the manufacturer, or the place of manufacture, the quality and quantity of the goods, directions for use, etc.

Labels are subject to the copyright law and should be registered before use or publication. If not registered, there is no protection in law against infringement. The continued use of a label, however, will give the person so using a certain proprietary right in it, which can be enforced in a court of equity and may be defended by injunctions, which will generally be granted. Such proceedings are expensive, annoying to a busy man, and at best will protect one only after at least a certain amount of damage has been done, and it is far safer to avoid this by registering the label at the time of issue, which will give one the further advantage in that a description of the character and quality of the article labeled can be set forth, which will, to a certain extent at least, be protected with the label.

The commercial value of a label and name is represented by the more or less general demand for the goods protected by it. In the canned-salmon industry, as in that of other food-packing industries, certain labels, through the good quality of the goods marketed under them and the publicity created for them, have become of very considerable value to the owners. A case in point is the label Royal Crown, owned by the late R. D. Hume. This was one of the earliest brands marketed in England, and some years later a certain Liverpool firm of salmon handlers paid Mr. Hume the sum of \$10,000 for the exclusive right to its use in England.

In designing a label there are several things which should be borne in mind. It should bear an easily remembered name and design; a name difficult of pronunciation should be avoided at all costs. For many years glaring red labels have been popular, but the success met with by those using more subdued and artistic designs and coloring indicates that the public appreciate them more than they do the older and coarser types. The design should be as simple as possible, as experience has demonstrated that a simple form—so simple that it can be fully understood by a mere glance—will gain by regular repetition, while a more complicated design will lose in this process.

A good many now in the business still remember the small label that was used on salmon cans before 1870. Labels about 3 by 5 inches in size, printed in one color, on white or colored newspaper, served merely the purpose of distinguishing cans, telling contents and manufacturer, and were without commercial value. About the year 1870 a few cannerymen commenced to import from the East and Europe full-sized labels, i. e., labels that went all around the can.

These were called by some "Pennington" labels, as a firm of that name supplied quite a number of them.

For some years they were used for the best grades only. They were printed in four and five colors, the design showing invariably a number of panels of different shapes and sizes. The lettering was not always plain and sometimes even intentionally irregular and puzzling. The colors were placed side by side, in boldest contrast, without any attempt to harmonize them.

It was soon discovered that the highly colored panels, while striking, lost all effect when massed on the retailer's shelves, and the different brands looked so much alike that the individual designs could not well be remembered by the customer, the only really distinctive feature being the name, and that was generally printed so small and indistinct that it could not readily be seen at a distance.

To remedy these defects, the designers soon reduced the number of panels and subdivisions, increasing meanwhile the size of the remaining ones and filling them with distinctive designs, still colored as simply as before, with no attempt at blending of colors. The background, at first perfectly plain, commenced to show patterns more or less complicated, and at times quite pretentious, so as to take away from the design proper.

Gradually the panel design disappeared. In place of it some showed one continuous picture on the label, which was very unsatisfactory and soon disappeared, as only a fraction of the picture could be seen at one time. Others had two subdivisions, one showing the name of the brand with its illustrations, occasionally used as a trade-mark, the other showing the article packed in the can, both named and illustrated. Unfortunately, these subdivisions were so large that the roundness of the can prevented one from seeing the picture as a whole, but this was soon remedied by making the subdivisions narrower and filling in between with directions, weight of contents, etc.

From this point on the general plan of labels underwent few changes except that the work, both of the artist and pressman, improved wonderfully, some of the labels now designed and printed being real works of art.

Up to a few years ago one of the most serious evils in the trade was the use of misleading and lying brands. The high-grade product would almost invariably be correctly and fully branded, but "chums" and "pinks" were usually branded as "Fresh salmon," "Choice salmon," etc., which would deceive all persons but those well acquainted with the industry. "Do-overs" and very poor fish were usually marketed under a brand which bore the name of a fictitious company or of no company at all.

The passage of State laws of varying degrees of efficiency governing the branding of salmon helped slightly to remedy this condition

of affairs, but it was not until the pure food and drugs act, approved June 30, 1906, was put into force by the Government that any radical improvement was noticeable. At the present time but few misleading brands are in use.

#### BOXING OR CASING.

A case of salmon generally contains 48 one-pound cans or their equivalent, i. e., 24 two-pound cans or 96 half-pound cans. Some canneries pack their half-pound cans in cases of 48. These cases are usually made of wood and cost from 9 to 11 cents each knocked down.

#### CAN MAKING.

Some of the canneries in the coast States purchase their cans ready-made, but the usual method is to purchase the sheet tin and make up the cans in the canneries. This is especially necessary in Alaska, as it would be impossible to find room on the cannery ships for such a bulk as they would make in addition to the other supplies necessary. Furthermore, the making of cans provides work for a large part of the crew, otherwise unemployed while the rest are getting ready the other necessary paraphernalia. The work is done by machinery and occupies several weeks' time.

#### CANNING SMOKED SALMON.

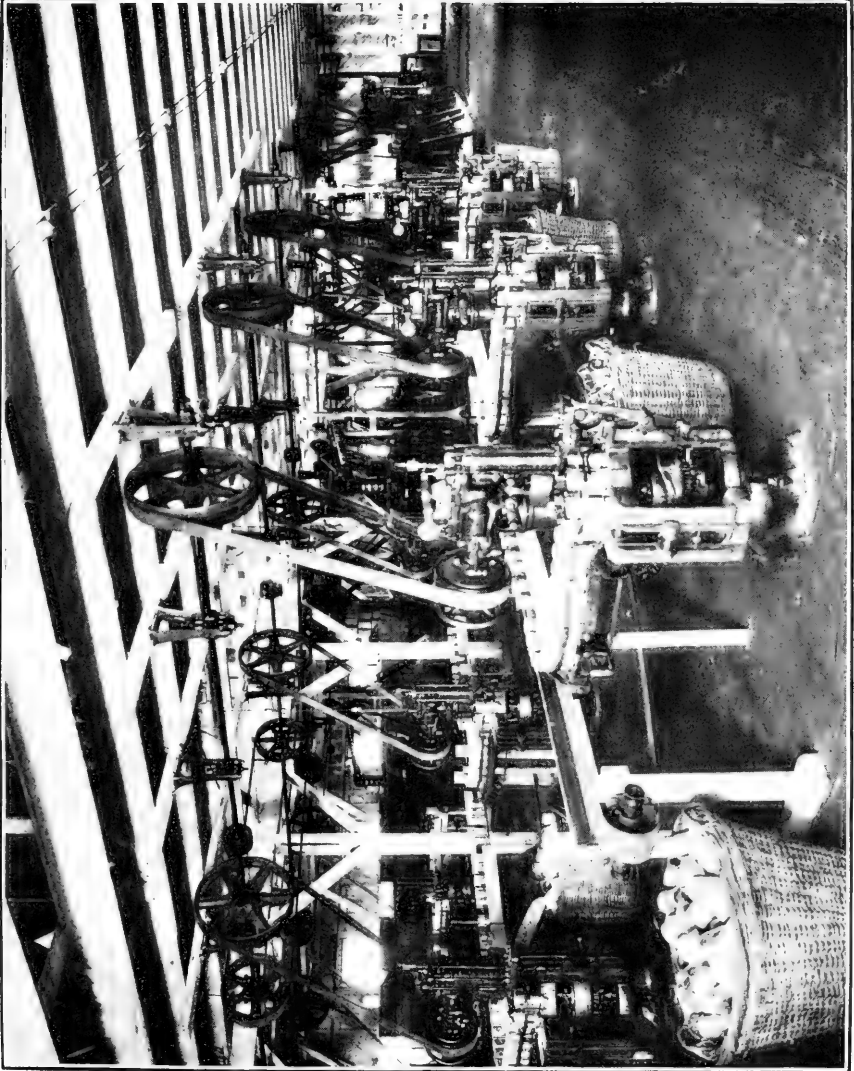
A number of ventures in the line of canning smoked salmon have been made on this coast, but most of the pioneers were not content or able to invest the amount of capital needed and wait the time required to create a demand for such products, and soon quit.

One of the leading British Columbia packers, H. Bell-Irving & Co., some years ago put up in cans some pink salmon which had been treated to an artificial smoke in a vat, and these are said to have made a favorable impression in Australia. Another canner operating on the Fraser River smoked pink salmon, and then, cutting them to the proper length, packed them dry in half-pound cans.

In 1908 the Columbia Canning Co. put up at its cannery on Chilkoot Inlet, Alaska, some smoked salmon which had been shaved into thin strips like dried beef. These, called "Flaxamo," were packed in oil and were very good, especially in making sandwiches.

In 1915 two companies began in Seattle the smoking, slicing, and canning of coho and king salmon. These were put up in oblong flat cans of various sizes, similar to sardine cans,  $2\frac{1}{4}$ ,  $4\frac{1}{2}$ , and  $7\frac{1}{2}$  ounces, respectively, while for a special trade a  $7\frac{1}{2}$ -pound can was also packed. These fish were cut quite thin, about 40 to 50 slices to the pound, and were packed in hermetically sealed cans with cottonseed oil. The fish were all hard smoked before slicing and canning.

The same companies are also putting up kippered salmon in cans.



MAKING SALMON CANS.

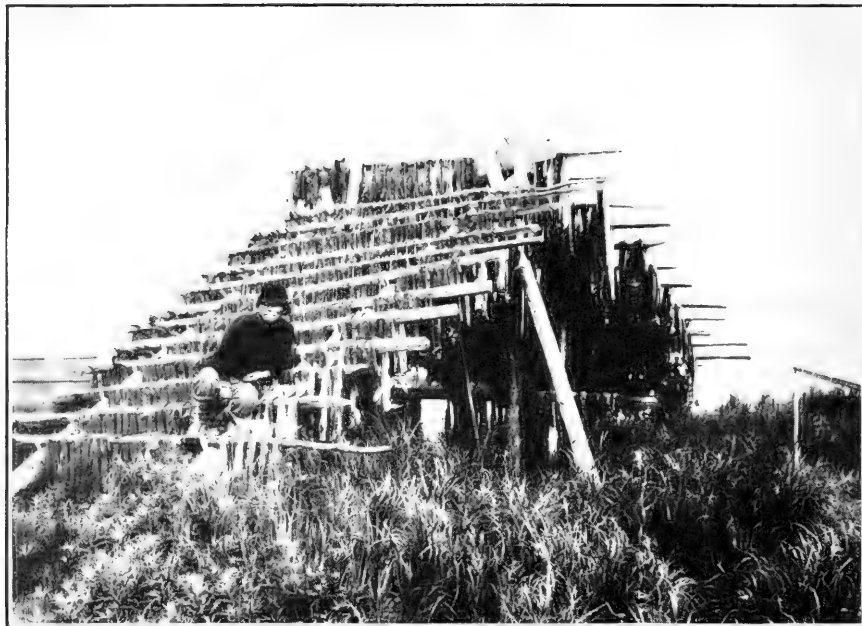


FIG. 1.—AN INDIAN SALMON DRYING RACK, BERING SEA, ALASKA.



FIG. 2.—THE BARONOVICH SALMON SALTERY; THE OLDEST SALTERY IN ALASKA.

Salmon loaf, made by mixing salmon with flour and various other ingredients, thus producing a paste, is also being canned by several packers.

A straight salmon paste, made solely from the flesh of the salmon, is being manufactured by one of the leading packers.

#### HOME CANNING.

At a number of places along the coast it has become the custom for the thrifty housewives to do a little home canning of salmon for winter use when the fish are abundant and cheap, and they find canning salmon as easy as canning vegetables and fruit. The fish is dressed, skinned, and the backbone removed. It is then cut into transverse strips of a size to fit either a pint or a quart glass jar, whichever is to be used. The jars are then filled with the pieces, salted to taste, the rubber ring put on, after which the can cover is put on loosely so that the steam may escape. Strips of thin wood are placed at the bottom of a kettle or wash boiler and the cans set down on them. Enough cold water is then poured into the kettle to bring it up to within an inch or two of the top of the cans. The kettle is then put on the stove and, after it comes to a boil, note is made of the time and the cans are cooked from one and one-half to three hours. There seems to be a great variation in the time of cooking on the part of the operators. Some even cook only one hour, but these generally use a preservaline. About two hours seems to be the best time, as the bones are then quite soft. At the end of the cooking period the tops are tightened, the kettle removed from the stove, and the water and cans allowed to cool in the kettle.

#### MILD CURING.

The beginning of the business of mild-curing salmon, or "sweet pickling," as it is sometimes called, is of comparatively recent date.

In 1889 a German dealer came to the Columbia River and tried to interest some of the cannery men in the business. J. O. Hanthorn, M. J. Kinney, and J. W. Cook were persuaded to prepare some, and the plant of the Northwest Cold Storage Co., at Portland, was used to keep the fish at a low temperature during repacking and preparation for shipment. These fish were shipped to Germany, but the shippers received no financial returns, word coming back that the fish were not satisfactory.

Owing to this lack of success from the first effort, no further attempt was made until 1894, when Mueller & Loring, of Chicago, put up a carload of mild-cured salmon at Kalama, Wash., and shipped it to Germany. In 1896 Charles Ruckles and Wallace Bros., of Kalama, packed several carloads for the German market. It was not until 1898 that the business was permanently established on the Columbia,

the Trescott Packing Co. and S. Schmidt & Sons putting up plants at Warrenton and Astoria, respectively.

In 1900 the Trescott Packing Co. began packing the spring and fall runs, and the Sacramento River Packers' Association packed the fall run on the Sacramento River, the business being carried on here every year since.

In 1901 the Sacramento River Packers' Association began at Monterey the mild curing of the spring salmon that were taken with hook and line in the open ocean.

S. Ellmore & Co. started the industry in 1902 at Tillamook, and the business began on Puget Sound in 1901, when the San Juan Fishing & Packing Co. and the Seattle Fish Co. took it up. The Pacific Cold Storage Co. began the next year at Anacortes.

Prior to 1906 several of the Alaska cannery men put up each season a few tierces of mild-cured salmon, but it was not until this time that the industry really began as such. In that year J. Lindenberger (Inc.) started packing at Ketchikan, Alaska. The following year several other plants were started, and in 1910 almost all of the king salmon taken in southeast Alaska were mild cured.

In mild curing the fish are split down the middle, the head, tail, and all fins except the pectorals removed, and the backbone cut out. The fish is then in two halves. Each of these halves, or sections, is then scored on the outside eight or nine times with the knife. They are then thrown into a cleaning vat, and here the inner side of each section is carefully scraped clear of blood and membrane with a knife, while the outside is thoroughly cleaned with a scrubbing brush. The sections are then laid carefully inner side up in another vat partly filled with clear, cold, running water, or into a tierce partly filled with fresh water and cracked ice, in which they remain for an hour. Formerly the fish were put into brine, but it has been found that ice water answers the purpose much better. After being thoroughly cooled, the sections are salted down in the tierces, each one being laid with its tail toward the center. Usually about 50 whole fish are required to fill a tierce. The pickle is made to a strength of 90° and should be strained before putting in the tierces. The tierces are then put in a cold storage chamber with a temperature of 35 to 38° F. They are held here from 14 to 21 days, care being taken to keep them full of pickle, which can be added through the hole in the head. The fish shrinks about 30 per cent during curing. After curing fish are taken from the tierces, the salt and slime are carefully removed and the fish repacked in the tierces without salt. When full of fish ice cold pickle with strength of 90° is added, the tierces tested to see if they are air-tight, and then taken back to the cold storage to await shipment.



In the early days of the industry different preparations, which included salicylic and boracic acids, were used to help preserve the fish. This caused much complaint from the Germans, and finally their Government subjected our product to a rigid inspection, with most salutary results, as now it is one of the purest and best products put up on this coast, the use of acids being done away with entirely.

The king salmon is almost invariably the species mild cured, being the only one large enough to answer the requirements of the trade. In 1907 a Ketchikan, Alaska, packer put up a quantity of coho, dog, and humpback salmon, but he found so much difficulty in disposing of the product that he abandoned further efforts in this line. A few cohos are put up each year.

The principal consumers of the mild-cured salmon are the smokers, who take them from the tierce, wash and soak them for a few minutes, and then have a practically fresh fish to smoke, and not, as in the days when hard-pickled salmon were used, one that had lost most of its oil and flavor through the excessive amount of salt needed to preserve it.

The greater part of the product put up on this coast goes to Europe, Germany being the principal consumer, but considerable quantities are sold in Norway, Sweden, and other countries, while the smokers of the cities east of the Rocky Mountains use large quantities every year.

In Germany, the principal market for mild-cured salmon, nearly all of the fish are smoked. One of the most popular ways of using the smoked salmon is in the making of sandwiches, and probably the greater portion of these are used in the beer halls and the automatic restaurants in that country.

#### PICKLING.

The earliest method of preserving salmon on the coast was by pickling. At times this industry attained to large proportions, but during the last 10 years it has been declining, largely because the canners are able to pay more for the raw fish than the salters. All species of salmon are pickled, but the most popular is the red salmon.

In dressing salmon for pickling the heads are removed, the fish split along the belly, the cut ending with a downward curve on the tail. The viscera and two-thirds of the backbone are removed, and the blood, gurry, and black stomach membrane scraped away. The fish are then thoroughly scrubbed and washed in cold water. They are next placed in pickling butts with about 15 pounds of salt to every 100 pounds of fish. The fish remain here about one week, when they are removed, rubbed clean with a scrub brush, and repacked in market barrels, one sack of salt being used to every three barrels of 200 pounds each. About 40 to 52 red salmon, 25 to 35 coho salmon,

70 to 80 humpback salmon, 10 to 14 king salmon, and 25 to 30 dog salmon are required in packing a barrel of pickled salmon.

A few salteries also pack "bellies." This product is merely the belly of the fish, which is the fattest portion, and as most of the packers threw away the rest of the fish, thus causing a very large waste of choice food, this method has come under the ban of the law in some of the coast States and in Alaska. As a result, but few "bellies" are packed now, and most of these only when some economic use is made of the remainder. Humpback salmon furnish the major part of the "belly" pack.

#### DRY SALTING.

During the progress of the Russian-Japanese War the preparation of dry-salted dog salmon became an important industry, but as soon as the Japanese fishermen resumed their former occupations the demand fell off so much that the industry was virtually abandoned in the United States, although a number of Japanese continue it in British Columbia. The fish, after being dressed, were packed in boxes, in salt, these boxes holding about 560 pounds of fish, and were shipped in this condition to Japan.

At a number of places in Alaska the bellies of red and coho salmon are cut out and salted, after which the backs are dried in the sun and, thus cured, are used for fox food at the numerous fox ranches. This product is called "ukalu."

#### SMOKING.

The smoking of salmon is virtually a continuation of the pickling, as the fish must be pickled before being smoked, the main purpose of the pickling being to preserve them until the time arrives for smoking, which may be weeks or months after the fish are caught. For smoking them the salmon are taken out of the barrel and soaked until as much as possible of the salt is removed. They are then put into the smokehouses and subjected to the heat and smoke of a fairly hot fire for about two days in order that they may be thoroughly dried and hardened. Exposure to a smoldering fire (alder wood is a favorite fuel) for about three days completes the process.

For shipment smoked salmon are packed in wooden boxes, oil paper being placed between the fish.

A variation of the smoking process is known as "kippering." With this method the salmon are dried in a hot fire for about 20 hours and then smoked over another hot fire for about 24 hours. The "buckling" process is also similar to this.

Dog and king salmon are often cut into steaks and kippered. As the sale of white-meated king salmon is somewhat hampered by the whiteness, the smokers use a coloring preparation, known in the



SALMON OFFAL READY FOR DELIVERY TO THE FERTILIZER PLANTS.



SHIP, WM. H. SMITH, FLOATING CANNERY AND COLD-STORAGE PLANT.

trade as Zanzibar carmine. This gives the outside of the fish a deep-colored red gloss, but leaves the inside its natural white color. The steaks, averaging 1 pound each, are wrapped in paper and packed in baskets holding 10 pounds each.

A smoked product, known locally as "beleke," is put up at Kodiak, Alaska, from red and coho salmons. Steelhead trout are the best for this purpose but are not often utilized owing to their scarcity in this region. In preparing "beleke" only the backs of the fish are used, the belly part being cut out and pickled separately. The backs are divided into three grades, according to size, viz, "small," "medium," and "large." They are first put into a brine, the "large" being put in first, followed by the "medium" and "small" at intervals of one hour each, so that all will be cured at about the same time. The coho backs, being the largest, are kept in the brine from 19 to 20 hours, while the red salmon backs, which are smaller, remain in the brine only about 16 hours. After being thoroughly salted the backs are removed from the brine and rinsed in fresh water, then hung in the air for about 24 hours to dry and to allow a thin skin to form on the outside. They are then hung in the smoke-house, in the presence of a little fire of cottonwood or alder. On dry days the gable windows are thrown open and the wind allowed to pass through while the smoking is going on. The smoking must be done slowly, two weeks being devoted to it.

There is a good demand for this product locally, the fish selling for from 15 to 20 cents a pair, but little effort has been made to extend its sale outside of central Alaska.

#### FREEZING.

The process of preserving fish by freezing was first introduced in 1888. Previous to this the comparatively ancient method of packing with ice, or in rare instances letting the fish freeze naturally during the winter months, was followed. Packing with ice is in quite general use to-day for shipments of fish which are to be preserved for short periods of time. Cooling with ice never results in a temperature lower than 32° F., which, of course, does not freeze the fish.

The freezing of salmon and steelhead trout began on the Sacramento and Columbia Rivers in the late eighties. It was taken up in a small way on Puget Sound in 1892. That year Wallace Bros. and Ainsworth & Dunn froze a small lot, the work being done for them by the Seattle Ice Co. (now the Ice Delivery Co.), and the venture was so successful that the next year nearly all of the wholesale dealers on the Sound took up the business. The Crescent Creamery, of Tacoma, also engaged in the business for the fish dealers for a year or two shortly thereafter. In 1902 the British Columbia Packers' Association bought a large cold-storage plant at New Westminster,

British Columbia, at that time the only large and modern plant in the province, and began the active freezing of fish. Since then a number of excellent plants have been built and operated. In Alaska the preparing of frozen salmon began in 1902. The San Juan Fishing & Packing Co., soon to be succeeded by the Pacific Cold Storage Co., put up a cannery and cold-storage plant at Taku Harbor, in southeast Alaska, in 1901, though it did not operate the cold-storage portion until 1902. This is the only plant which was operated in Alaska until the New England Fish Co. erected in 1909 a large plant at Ketchikan for the freezing of halibut primarily, but considerable quantities of salmon have been frozen also.

In 1911 the schooner *Metha Nelson* was fitted up as a floating freezer by the Alaska Packers Association and sent to Kodiak Island. As the vessel arrived in San Francisco shortly before the State's closed season on salmon began, and it was a difficult matter to dispose of the catch before then, the business was abandoned.

In 1912 J. Lindenberger (Inc.) opened a freezing plant at Craig, on Fish Egg Island, Alaska, while the ship *William H. Smith* was outfitted as a floating cannery and freezer by the Weiding & Independent Fisheries Co., at Saginaw Bay, Alaska. The latter operated only one season.

The year 1913 saw quite a development in the industry. The Columbia & Northern Fishing & Packing Co., at Wrangell, the Juneau Cold Storage Co., at Juneau, the Booth Fisheries Co., at Sitka, and the floating cold-storage ship *Glory of the Seas*, by the Glacier Fish Co., at Idaho Inlet, were all started this year.

In 1914 the Ketchikan Cold Storage Co. opened a freezer for the general commercial freezing of fish.

The freezing of salmon is almost invariably carried on in connection with other methods of handling and preserving, and the purpose is usually to secure the fish when numerous and cheap, freeze them, and then hold them until the runs are over and the fish are once more in good demand at high prices. The business proved so profitable, however, that the dealers began to look for wider markets for their product. Europe, more especially Germany, was prospected and a profitable market soon developed, with the result that to-day frozen Pacific salmon can be secured in nearly every town of any size in western Europe, while large quantities are marketed all over our own country.

There are four important features in packing and using frozen salmon: (1) To get fresh fish; (2) to keep them cold (about 15° above zero) after they are frozen; (3) to keep a coat of ice on them; and (4) to allow them to thaw slowly in cold water before cooking.

In selecting salmon for freezing, only the finest and freshest of each species are used. The current belief that freezing destroys the

flavor of the fish is erroneous, the flavor depending entirely upon the condition before freezing, and the quicker they are frozen after being caught the better will the natural flavor of the fish be preserved. Frozen salmon are just as wholesome as fresh, and their chemical constituents are almost identical. The danger lies in the temptation to freeze the fish after decomposition has set in, but, fortunately, this is now very rarely practiced in the salmon industry.

The coho, or silver, and the chum, or keta, salmon are the choicest of the salmons for freezing. The other species except the red, or sockeye, which is too oily and rarely frozen, are also frozen in varying quantities. The steelhead trout, which is ranked by the Pacific coast dealers among the salmon, is considered the choicest fish of all for freezing.

Some of the most modern plants in the country are on this coast. These have numerous freezers, generally, in which a temperature of from 25° to 30° F. below zero can be maintained if desired, although a temperature of more than 10° below zero is rarely ever required. All freezing is by direct expansion and each freezer is piped with about 2 feet of 1½-inch pipe per cubic foot of freezing space. The bunkers in the freezers are in pairs, generally nine pipes wide, spaced 10 inches apart. This leaves about a 3½-foot passage through the center of each freezer opposite the swing doors. The salmon are laid on pans, which are placed on the tiers of pipes.

After freezing, the salmon are passed through openings in the rear of the freezers into the glazing room, which has a temperature of about 20° F., where they are dipped into water, and when removed are covered with a thin glaze of ice, which may be thickened by repeated dippings. This is an extra precaution to exclude the air from the fish.

After being thoroughly frozen and glazed, each fish is covered first with a parchment, like rolls of butter, and then with a piece of heavy brown paper. They are then packed in boxes holding about 250 pounds each, placed in the cold-storage cars and shipped.

#### UTILIZING SALMON EGGS.

Every year immense quantities of salmon roe are thrown away in the fisheries of the west coast, though there is but little doubt that, if properly prepared, a market could in time be found for this now waste part of the fish. In France there is a good market for a product known as "rogue," which is the spawn of cod, haddock, hake, and pollock salted in casks, and which is used as bait in the sardine fisheries. Salmon spawn is the choicest and most successful bait used on this coast, and if properly prepared would undoubtedly answer the purpose as well as the regular "rogue" if not better, owing to its oiliness and attractive color. The roes should be soaked for

some days in old brine and then packed in strong casks holding about 25 gallons each. It might also prove to be a good bait for tolling mackerel on the Atlantic coast.

In 1910 a considerable quantity of salmon roe was prepared in Siberia and sold in competition with caviar, which is prepared from sturgeon eggs. The product met with favor in Europe and now large quantities are prepared each season.

In this country Miss Ida Tuholski, of San Francisco, who had been engaged in the preparation of sturgeon caviar for some years, put up a number of sample lots of salmon caviar which were fully the equal of the best sturgeon caviar. Capital has been chary, however, about engaging in the business, although undoubtedly it will be an important industry some day.

For making caviar the eggs should be as fresh as possible, and in order to make sure of this the salmon, all species, except the sockeye and coho, are utilized in Siberia: the chum eggs make the best caviar. They are taken alive, if possible, shortly after coming from the water, killed and bled, the belly opened up and the roe taken out. This work can best be done on work and living scows anchored close to the fishing camps. The roe is placed upon a stand, the top of which is formed of a small-meshed galvanized-iron wire screen. On the underside is arranged a zinc-lined trough. The operator gently rubs the mass of eggs back and forth over the screen, the mesh of which is just large enough to let the eggs drop through, and, as they are separated from the membrane by the rubbing, they fall through into the trough and are thence drawn off into tubs by means of a sliding door at the end of the trough.

After all the roe has been separated the tub is removed and a certain proportion of salt (the sturgeon caviar makers employ the best Lunenburg, Germany, salt in this work, while some of the Siberian makers of salmon caviar use no. 2 Berkshire salt from England) is added to the roe, after which the mass is mixed with the hands. The most delicate part of the whole operation is in the manner of mixing. No direct rule can be given for doing this portion of the work, as the condition of the roe regulates the time consumed and the manner of handling. It requires practical experience to become proficient, but this should be an easy matter for one used to handling salted products. The sturgeon caviar makers use about 11 pounds of salt in preparing a keg of caviar.

After the salt has been added the mass of eggs first dries up, but in a few minutes the strength of the salt draws from the eggs their watery constituents and a copious brine is formed, which can be poured off when the tub becomes too full. In Siberia the caviar makers put the eggs into a brine solution of 19 to 22 per cent Baumé strength immediately after they come from the trough. The salted



eggs are then poured into very fine-meshed sieves which hold about 10 pounds each. In the caviar house are arranged long, sloping boards with narrow strips nailed on each side. On these the sieves are placed and left here from 8 to 20 hours in order to thoroughly drain.

The Siberian caviar makers hasten the operation by putting the eggs into a brine solution as noted above, leave them there for from 25 to 45 minutes, then place them in bags and subject them to heavy pressure, after which they are packed. While this method occupies less time, it is not thought the resulting product is as good as that prepared by the slower method outlined above.

The eggs are then transferred to small casks (holding about 135 pounds). The sturgeon caviar makers use oak or pine casks, but some of the Siberian makers say that oak casks turn the salmon caviar black. The casks are steamed before use in order to prevent any possible leakage. It is especially necessary that the kegs or barrels used be air-tight, as otherwise the product will spoil. Barrels such as used in packing salt salmon are rarely ever tight enough to hold caviar. The casks are covered and allowed to stand until the gas escapes and the eggs settle. The vacant space caused by the settling is then filled, the cask headed up and put in a cool place until ready for shipment.

The Siberian salmon caviar makers use a small quantity of "preservaline" in each keg for the purpose of aiding in preserving them, as cold storage facilities are quite primitive as yet in that country, and it is the addition of this powder which forms the mysterious part to the uninitiated. No preservative would be needed in Alaska, however, as the kegs could be shipped in cold storage along with the mild-cured salmon.

Several establishments are putting up these eggs in jars and hermetically sealed cans for use as bait in sport fishing.

#### MISCELLANEOUS PRODUCTS.

A few years ago a company on the Columbia River put up what was known as "fish pudding." In preparing this the salmon was ground fine, mixed with milk and eggs, and then packed in tin cans. The preparation was soon abandoned.

In 1903 one of the Point Roberts canneries packed a new product which was called "salmon paste." For this the fish was ground up, cooked, seasoned with spices, etc., and made into fish balls, a very palatable dish when warmed over.

In 1905 a Seattle concern began the manufacture of wienerwurst sausages from halibut and salmon.

The Indians in the Bristol Bay region of Alaska occasionally dress the skins of salmon and make of them leather for the tops of boots, also bags and other small articles.

A product, which was first made in Norway, is prepared by means of an invention which quickly dries and pulverizes the flesh of fresh fish. The resulting powder, called "fish flour," is easy to transport from one place to another and has great nutritive value. It is probable that the tailpieces of the fish, which are at present thrown away, and the cheaper grades of salmon might be prepared in this way and thus furnish another market for salmon.

#### MEAL, FERTILIZER, AND OIL.

As early as 1888 there was a small plant at Astoria, Oreg., where the refuse of the canneries was utilized for the manufacture of oil and fertilizer. In that year 8,000 gallons of oil (chiefly from salmon heads), and 90 tons of fertilizer were prepared. The oil was worth 22½ cents per gallon and the fertilizer had a market value of \$20 per ton. Most of the refuse was dumped into the river, however. In 1898 a similar plant was established in the Puget Sound district of Washington. At present the plants of the Robinson Fisheries Co. and Marani Products Co., at Anacortes; the Pacific American Fisheries at Eliza Island, near Bellingham; the Pacific Products Co. at Port Townsend, and the Japanese-American Fertilizer Co. on Lummi Island, all on Puget Sound, operate quite largely on the offal from the Sound salmon canneries.

In 1882 the Alaska Oil & Guano Co. established a fertilizer plant at Killisnoo, Alaska, for the extraction of oil and fertilizer from herring, and has operated the plant continuously ever since. In some years large quantities of whole salmon have been handled at this plant, and the resulting product was found to sell as well as that from herring.

In Alaska the Fish Cannery By-Products (Ltd.), in 1914 built a large plant at Ward Cove, near Ketchikan, where salmon offal is used in the preparation of fertilizer, meal, and oil. The company is now experimenting in the preparation of various chemical products from the raw material.

Probably the most serious evil in the salmon industry to-day is the enormous wastage which annually occurs. Over one-fourth of the total weight of each fish handled at the various packing plants is thrown away. With the exception of the tailpiece, which is discarded at some canneries owing to the excessive amount of bone which would be in the product if canned, this waste material could not be utilized as food, comprising as it does the head, viscera, fins, and tail. When not conveniently near the very few fertilizer plants at present in operation this product is either allowed to pass through chutes into the water under the cannery, or is dumped into scows and towed to the ocean or the deeper waters of the sounds, and there thrown overboard. This procedure is not only exceedingly wasteful, but is also far from beneficial to the waters where deposited.

The great desideratum in the salmon fisheries of the Pacific coast at the present time is the invention of a small odorless fertilizer plant, costing not more than \$2,500 or \$3,000, which can be installed at the various salmon canneries and salteries. The offal from the cannery could there be utilized and the product obtained would doubtless net a fair return on such an investment, while at the same time the present (in the aggregate) enormous waste would be stopped, and the waters adjacent to the canneries rendered far more agreeable to the fishes as well as to the people on shore. It is absolutely essential that the plant shall be odorless, as the smell of the ordinary fertilizer establishment would be very offensive to persons visiting the cannery and would not enhance the demand for canned salmon. At the present time the cheapest plant available costs about \$10,000, and very few canneries can afford to invest this sum of money in the disposal of their own offal alone.

A recent issue (1915) of *Fertilizers*, of London, England, has the following to say upon this subject:

- Investigations conducted at the Agricultural Experiment Station at Harleshausen (Germany) go to show that, provided it is of good quality, fish meal forms a suitable supplementary feeding stuff for farm animals, especially for pigs. Unfortunately, however, it is made in cases from inferior products, such as decomposing fish and herring meal containing excessive quantities of salt, or it may be adulterated with bone meal and carcass meal. Fish meals made from low-grade material may have a harmful effect on the health of the animals to which they are fed. The German report goes on to say that fish meal is commonly produced partly from fish offal and partly from whole fish condemned as unfit for human consumption, or which is unsalable owing to an excessive supply. Purchasers are warned that great care is necessary in buying fish meal, as, apart from the varied nature of the raw material from which it is made, the methods of preparation may produce wide differences in its composition. From the analyses of a large number of different samples of fish meal the proportion of different constituents was found to vary between the following limits:

Water 5.90 to 18.91 per cent; crude protein, 38.83 to 58.96 per cent; digestible protein, 30.43 to 54.52 per cent; fat, 1.55 to 14.03 per cent; phosphate of lime, 7.80 to 36.16 per cent; salt, 0.70 to 20.10 per cent; ash, 20.53 to 45.07 per cent; sand, 0.10 to 6.05 per cent.

Its richness in protein renders fish meal especially suitable for combination with foods, such as roots and potatoes, which possess a low percentage of that constituent. If fed in too large quantities or containing too high a percentage of oil the meal is liable to give a fishy taste to the meat product. It has been commonly accepted that high-grade fish meal should not contain more than 2 to 3 per cent of fat, but when the proportion of meal used in the ration is not too high it is considered (says the report) that there is no objection to using meals containing up to 4 per cent. Among the mineral constituents contained in fish meal are phosphate of lime and salt, both of which are indispensable in the feeding of animals. In the case of salt, however, an excessive amount is valueless, and may even cause illness. For this reason the proportion of salt contained in fish meal should not exceed 3 per cent. The quantity of fish meal which may be fed with advantage to the different kinds of farm stock varies according to the class of stock and to the quality of the meal. It is suggested that the following amounts may be given daily if the meal is of good quality: Cattle, 2 pounds for every

1,000 pounds live weight; pigs, one-fourth to one-half pound per head according to weight; and sheep, one-tenth to one-fifth pound for every 100 pounds live weight.

A great impetus has been given to the industry during the last two years, owing to the big demand which has come from the farmers and poultrymen for fish meal or scrap, which, after it has been mixed with other ingredients, can be fed to cattle, hogs, and poultry. Experiments carried out at various agricultural experiment stations, both here and in Europe, show conclusively that this class of food increases the appetite of the animal, and consequently the weight, while it does not affect the flavor of the flesh of the animals.

#### SHIPPING SALMON DIRECT TO CONSUMER.

An important new feature in the salmon industry is the shipping of individual salmon direct to consumers by express, or, for certain short distances, by parcel post, for a certain fixed sum, which includes the fish itself and the cost of delivering same to the buyer.

This business began in Tacoma, Wash., in 1914, and those who originated it advertised throughout the country that they would ship a fresh salmon to any express office in the United States (except Southern Express), express prepaid, for \$1.25, weight 7 to 8 pounds. In 1915 the cost, delivered east of the Mississippi River, was raised to \$1.50 each, the old rate of \$1.25 still being in force for shipments west of the Mississippi River. The number of shippers has increased very much, and the business is now carried on from a number of places in Washington, Oregon, and California.

In shipping an individual fish, it is packed in a box containing 20 pounds of cracked ice. These boxes are collected by the express companies and are generally sent out in their own regular cars attached to trains leaving in the evening. About every 15 to 20 hours the box is opened and from 5 to 7 pounds, depending upon the weather, of cracked ice added to the box to make up the loss through melting.

As the Post Office Department will not accept packages in which ice is used for preserving fish, the use of the parcel post for shipments of individual fish is limited to the first postal zone (up to 50 miles from the initial point), except in winter, when the postmasters are authorized, in their discretion, to accept shipments for the second zone (50 to 100 miles from the initial point). In making fresh fish shipments by parcel post, frozen fish are generally used.

Most of the orders come from the Middle West, where fresh fish are not abundant, but orders are received from all sections of the country.

The success met with in shipping fresh salmon led to a considerable expansion of the industry, with the result that now one can obtain not only a fresh salmon, but also may purchase salt, smoked, and kippered salmon, salt codfish, and fresh halibut, smelt, crabs, and other sea food in its season.

## VIII. NUTRITIVE QUALITIES OF SALMON.

More and more attention is being paid by the consuming public to the nutritive qualities of the food products offered them, and this is especially true as regards fishery products.

The proper functions of food are two-fold, first, to furnish protein for building and repairing the body, and second, to supply energy for heat and muscular work. Foods which supply an abundance of both at a reasonable price are of the greatest importance from an economical standpoint.

Despite the great prominence of the salmon industry, but little time has been devoted to it by the chemist.

Prof. W. O. Atwater was the first American investigator to devote any portion of his energies to the analysis of Pacific salmon. In Farmers Bulletin No. 142, United States Department of Agriculture, he gives the following analysis of canned Pacific coast salmon: Water, 63.5 per cent; protein, 21.8 per cent; fat, 12.1 per cent; ash, 2.6 per cent; fuel value per pound, 915 calories.<sup>a</sup>

C. F. Langworthy, in "Fish as food" (Farmers Bulletin No. 85, United States Department of Agriculture), gives the following analyses of fresh and canned Pacific coast salmon:

Fresh salmon, California (sections): Refuse (bone, skin, etc.), 5.2 per cent; water, 60.3 per cent; protein, 16.5 per cent; fat, 17 per cent; mineral matter, 1 per cent; total nutrients, 34.5 per cent; fuel value per pound, 1,025 calories.

Canned salmon—refuse (bone, skin, etc.), 3.9 per cent; salt, 1 per cent; water, 59.3 per cent; protein, 19.3 per cent; fat, 15.3 per cent; mineral, 1.2 per cent; total nutrients, 35.8 per cent; fuel value per pound, 1,005 calories.

Dr. Harvey W. Wiley gives the following as the composition of a Pacific coast salmon (species not given):<sup>b</sup>

Fresh—Water, 63.61 per cent; protein, 17.46 per cent; fat, 17.87 per cent; ash, 1.06 per cent. Dry—Protein, 52.31 per cent; fat, 49.05 per cent; ash, 2.92 per cent.

On page 137 of the same work Dr. Wiley gives the following as the mean of three samples of Pacific coast canned salmon:

Composition of canned salmon.—Mean of three samples. Water-free substance: Protein, 53.52 per cent; fat, 40.52 per cent; ash, 6.24 per cent.

<sup>a</sup> The unit used to show the fuel value is the "calorie," and is the amount of heat which would raise the temperature of about 1 pound of water 4° Fahrenheit.

<sup>b</sup> Foods and their adulteration, etc. By Harvey W. Wiley, p. 135. (3 vo., Phila., 1907.)

Prof. Knisely,<sup>a</sup> of the Oregon State Agricultural College at Corvallis, Oreg., analyzed canned salmon packed at the Funter Bay (Alaska) cannery of the Thlinket Packing Co., with the following results:

Species.	Moisture.	Protein.	Fat.	Ash.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Sockeye, or red .....	64.74	24.19	9.11	2.06
Coho, or medium red .....	68.22	26.56	3.61	1.66
Hum pback, or pink .....	69.43	24.00	4.86	1.68
Keta, or chum .....	67.08	25.06	6.59	1.26

H. M. Loomis, chief of the Seattle food and drug inspection laboratory, Bureau of Chemistry, United States Department of Agriculture, reports as follows on analyses of both canned and fresh Pacific salmon made at this laboratory.<sup>b</sup>

#### CANNED SALMON (1911 PACK).

[Each sample is average of two or more cans. All samples, except no. 2, are old form 1-pound tall cans. No. 2 is  $\frac{1}{2}$ -pound flat cans.]

Samples.	Water.	Ethyl ether extract. <sup>a</sup>	Protein (Nx6.25).	Total ash.	NaCl. <sup>b</sup>	Ammoniacal nitrogen.	
						Richardson method.	Alcohol vapor method.
	<i>Per ct.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per ct.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
No. 1. Puget Sound sockeye .....	62.44	16.17	20.25	2.50	0.79	0.0403	0.0348
No. 2. Puget Sound sockeye .....	61.84	13.74	21.77	2.73	1.10	.0437	.0410
No. 3. Alaska medium red .....	69.97	7.81	20.40	2.58	1.09	.04965	.....
No. 4. Alaska chum .....	73.48	2.88	21.33	2.57	.83	.0563	.0557
No. 5. Alaska pink or humpback .....	74.12	4.75	19.75	1.98	.50	.0404	.....
No. 6. Alaska red .....	70.88	5.26	21.79	2.35	.64	.0455	.....

<sup>a</sup> Represents the fat.

<sup>b</sup> Represents the salt.

#### ANALYSES OF FRESH SALMON, EDIBLE PORTIONS.

Samples.	Water.	Ethyl ether extract.	Protein (Nx6.25).	Total ash.	NaCl.	Ammoniacal nitrogen.	
						Richardson method.	Alcohol vapor method.
	<i>Per ct.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per ct.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Puget Sound sockeye salmon (caught May 7, 1912) .....	67.48	8.86	22.24	1.36	.....	0.012L	0.0205
Puget Sound steelhead or salmon trout (caught May 7, 1912) .....	67.89	9.39	21.80	1.35	.....	.0135	.0218

<sup>a</sup> Pacific Fisherman, vol. VI, no. 1, January, 1908, p. 21.

<sup>b</sup> Eighth International Congress of Applied Chemistry, vol. XVIII, p. 239-245.

## IX. THE SALMON OUTPUT IN 1915.

### STATISTICS OF THE CATCH.

The following tables show, by sections and species, and also by waters for Alaska, Washington, Oregon, and California, the catch of salmon and steelhead trout in American territory on the Pacific coast in 1915, and show their value to the fisherman. Part of these data were obtained from the various State fish commissions and from the United States Bureau of Fisheries.

#### CATCH OF SALMON IN 1915,<sup>a</sup> BY STATES AND SPECIES.

Species.	Alaska.		Washington.		Oregon.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Coho, or silver.....	7,989,504	\$133,159	10,720,401	\$382,148	4,596,252	\$150,456
Chum, or keta.....	38,556,064	225,123	14,180,872	264,592	2,079,911	32,499
Humpback, or pink.....	123,585,576	624,941	29,644,561	222,331	.....	.....
King, spring, or chinook.....	13,440,834	362,184	19,884,530	902,575	23,539,866	1,382,148
Sockeye, red, or blueback.....	129,394,055	2,729,577	5,187,130	532,384	265,466	13,274
Steelhead trout.....	.....	.....	2,023,979	121,635	2,341,858	140,511
Total.....	312,966,033	4,074,984	81,641,473	2,425,655	32,823,353	1,718,888

Species.	California.		Total.	
	Pounds.	Value.	Pounds.	Value.
Coho, or silver.....	296,719	\$14,836	23,602,876	\$680,599
Chum, or keta.....	.....	.....	54,816,847	522,214
Humpback, or pink.....	.....	.....	153,230,137	847,272
King, spring, or chinook.....	8,212,506	410,625	65,077,736	3,057,532
Sockeye, red, or blueback.....	.....	.....	134,846,651	3,275,235
Steelhead trout.....	33,206	1,992	4,399,043	264,138
Total.....	8,542,431	427,453	435,973,290	8,646,980

<sup>a</sup> The published report of the Dominion of Canada for 1915 does not show the catch by species; the salmon as landed is reported at 136,939,400 pounds, valued at \$5,743,893.

#### CATCH OF SALMON IN ALASKA WATERS IN 1915, BY APPARATUS AND SPECIES.

Apparatus and species.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Seines:								
Coho, or silver.....	1,404,228	\$23,404	349,494	\$5,825	.....	.....	1,753,722	\$29,229
Chum, or keta.....	17,279,232	86,396	1,534,216	11,507	1,488	\$19	18,844,936	97,922
Humpback, or pink.....	46,170,204	230,851	2,879,772	21,598	.....	.....	49,049,976	252,449
King, or spring.....	251,592	5,718	20,658	469	117,546	2,671	389,796	8,858
Red, or sockeye.....	4,652,170	139,565	7,755,465	155,109	6,129,160	122,583	16,536,795	417,257
Total.....	69,757,426	485,934	12,539,605	194,508	6,248,194	125,273	88,545,225	805,715

## CATCH OF SALMON IN ALASKA WATERS IN 1915, BY APPARATUS AND SPECIES—Contd.

Apparatus and species.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
<b>Gill nets:</b>								
Coho, or silver.....	1,285,860	\$21,431	430,314	\$7,172	595,350	\$9,923	2,311,524	\$38,526
Chum, or keta.....	388,944	1,945	816	6	4,316,728	37,771	4,706,488	39,722
Humpback, or pink.....	391,200	1,956	4,536	21	148,000	555	543,736	2,532
King, or spring.....	1,707,882	38,815	832,194	18,913	3,101,428	70,487	5,641,504	128,215
Red, or sockeye.....	2,418,410	72,552	5,388,525	107,771	72,809,100	1,450,182	80,616,035	1,636,505
Total.....	6,192,296	136,699	6,656,385	133,883	80,970,606	1,574,918	93,819,287	1,845,500
<b>Traps:</b>								
Coho, or silver.....	2,355,792	39,263	956,172	15,936	144,300	2,405	3,456,264	57,604
Chum, or keta.....	11,335,912	56,680	2,051,608	16,387	1,647,120	14,412	15,034,640	87,479
Humpback, or pink.....	73,234,128	366,171	757,736	3,789	.....	.....	73,991,864	369,960
King, or spring.....	503,866	11,451	1,254,594	28,513	615,120	13,980	2,373,580	53,944
Red, or sockeye.....	7,099,035	212,971	17,215,560	344,311	4,970,080	99,402	29,284,675	656,684
Total.....	94,528,733	688,536	22,235,670	408,936	7,376,620	130,199	124,141,023	1,225,671
<b>Lines:</b>								
Coho, or silver.....	467,994	7,800	.....	.....	.....	.....	467,994	7,800
King, or spring.....	4,990,766	170,140	.....	.....	.....	.....	4,990,766	170,140
Total.....	5,458,760	177,940	.....	.....	.....	.....	5,458,760	177,940
<b>Dip nets:</b>								
King, or spring.....	.....	.....	45,188	1,027	.....	.....	45,188	1,027
Red, or sockeye.....	.....	.....	956,550	19,131	.....	.....	956,550	19,131
Total.....	.....	.....	1,001,738	20,158	.....	.....	1,001,738	20,158
<b>Total:</b>								
Coho, or silver.....	5,513,874	91,898	1,735,980	28,933	739,650	12,328	7,989,504	133,159
Chum, or keta.....	29,004,088	145,021	3,586,640	27,900	5,965,336	52,202	38,556,064	225,123
Humpback, or pink.....	119,795,532	598,978	3,642,044	25,408	148,000	555	123,585,576	624,941
King, or spring.....	7,454,106	226,124	2,152,634	48,922	3,834,094	87,138	13,440,834	362,184
Red, or sockeye.....	14,169,615	425,088	31,316,100	626,322	83,908,340	1,678,167	129,394,055	2,729,577
Grand total.....	175,937,215	1,487,109	42,433,398	757,485	94,595,420	1,830,390	312,966,033	4,074,984

## CATCH OF SALMON IN WASHINGTON WATERS IN 1915, BY APPARATUS AND SPECIES.

Apparatus and species.	Puget Sound.		Grays Harbor.		Willapa Harbor.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
<b>Drag seines:</b>						
Coho, or silver.....	40,770	\$1,699	27,708	\$1,154	.....	.....
Chum, or keta.....	64,864	1,216	272	5	.....	.....
Humpback, or pink.....	9,084	68	.....	.....	.....	.....
King, or spring.....	15,488	704	29,590	1,345	.....	.....
Steelhead trout.....	730	44	.....	.....	.....	.....
Total.....	130,936	3,731	57,570	2,504	.....	.....
<b>Purse seines:</b>						
Coho, or silver.....	3,106,365	76,466	.....	.....	.....	.....
Chum, or keta.....	10,247,648	192,140	.....	.....	.....	.....
Humpback, or pink.....	17,444,812	130,836	.....	.....	.....	.....
King, or spring.....	224,510	10,205	.....	.....	.....	.....
Sockeye, red, or blueback.....	1,223,465	210,112	.....	.....	.....	.....
Steelhead trout.....	113,975	6,839	.....	.....	.....	.....
Total.....	32,360,775	626,598	.....	.....	.....	.....
<b>Gill nets:</b>						
Coho, or silver.....	683,214	28,467	504,420	9,478	22,590	\$941
Chum, or keta.....	774,416	14,520	425,592	6,684	13,688	257
Humpback, or pink.....	143,932	1,080	.....	.....	.....	.....
King, or spring.....	510,114	23,187	340,940	14,216	139,788	6,354
Sockeye, red, or blueback.....	99,250	8,933	1,448,815	86,935	.....	.....
Steelhead trout.....	16,450	987	11,780	707	110	7
Total.....	2,227,376	77,174	2,731,547	118,020	176,176	7,559



CATCH OF SALMON IN WASHINGTON WATERS IN 1915, BY APPARATUS AND SPECIES—  
Continued.

Apparatus and species.	Puget Sound.		Grays Harbor.		Willapa Harbor.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Trap nets:						
Coho, or silver	3,825,648	\$159,402	272,640	\$11,360	150,258	\$6,261
Chum, or keta	1,422,112	26,665	145,056	2,720	93,744	1,758
Humpback, or pink	11,630,852	87,224				16
King, or spring	5,221,106	237,323	405,196	18,418	350,812	15,946
Sockeye, red, or blueback	2,091,650	197,249				
Steelhead trout	144,230	8,654	12,650	759		
Total	24,335,598	716,517	835,542	33,257	596,407	23,981
Reef nets:						
Coho, or silver	22,584	941				
Chum, or keta	8,944	168				
Humpback, or pink	92,952	697				
King, or spring	5,016	228				
Sockeye, red, or blueback	6,790	611				
Steelhead trout	2,500	150				
Total	138,786	2,795				
Set nets:						
Coho, or silver	411,372	17,140	121,170	5,049	35,856	1,464
Chum, or keta	170,840	3,203	124,336	2,331	100,768	1,889
Humpback, or pink	152,120	1,141				
King, or spring	131,186	5,963	158,664	7,212	104,786	4,763
Sockeye, red, or blueback	16,865	1,518	250	23	4,145	373
Steelhead trout	6,480	359	1,730	104	30	2
Total	888,863	29,354	406,150	14,719	245,585	8,491
Bag nets:						
Coho, or silver	3,600	150				
Humpback, or pink	2,100	16				
Total	5,700	166				
Lines:						
Coho, or silver	480,000	20,000				
King, or chinook	3,080,000	140,000				
Total	3,560,000	160,000				
Grand total:						
Coho, or silver	8,573,553	304,265	925,938	27,041	208,704	8,666
Chum, or keta	12,688,824	237,912	695,256	11,740	208,200	3,904
Humpback, or pink	29,475,852	221,062				16
King, or spring	9,187,420	417,610	934,396	41,191	595,386	27,063
Sockeye, red, or blueback	3,438,020	418,423	1,449,065	86,958	4,145	373
Steelhead trout	284,363	17,063	26,160	1,570	140	9
Total	63,648,034	1,616,335	4,030,809	168,500	1,018,168	40,031

Apparatus and species.	Columbia River.		Total.	
	Pounds.	Value.	Pounds.	Value.
Drag seines:				
Coho, or silver	40,338	\$1,681	108,816	\$4,534
Chum, or keta	5,224	98	70,360	1,319
Humpback, or pink	148	1	9,232	69
King, or spring	1,017,456	46,248	1,062,534	48,297
Sockeye, red, or blueback	60,820	5,474	60,820	5,474
Steelhead trout	236,390	14,363	237,120	14,407
Total	1,360,376	67,865	1,548,882	74,100
Purse seines:				
Coho, or silver	82,524	3,436	3,188,889	79,902
Chum, or keta	139,584	2,617	10,387,232	194,757
Humpback, or pink	141,400	1,061	17,586,212	131,897
King, or spring	58,600	2,664	283,110	12,869
Sockeye, red, or blueback	3,895	350	1,227,360	210,462
Steelhead trout	174,480	10,469	288,455	17,308
Total	600,483	20,597	32,961,258	647,195

CATCH OF SALMON IN WASHINGTON WATERS IN 1915, BY APPARATUS AND SPECIES—  
Continued.

Apparatus and species.	Columbia River.		Total.	
	Pounds.	Value.	Pounds.	Value.
<b>Gill nets:</b>				
Coho, or silver.....	74,724	\$3,114	1,284,948	\$42,000
Chum, or keta.....	231,960	4,349	1,445,656	25,810
Humpback, or pink.....	4,986	37	145,828	1,117
King, or spring.....	3,474,402	157,941	4,405,244	201,638
Sockeye, red, or blueback.....	24,065	2,166	1,572,130	98,034
Steelhead trout.....	368,892	22,134	397,232	23,835
Total.....	4,179,039	189,741	9,314,138	392,494
<b>Trap nets:</b>				
Coho, or silver.....	722,844	30,118	4,971,390	207,141
Chum, or keta.....	207,992	3,900	1,868,904	35,043
Humpback, or pink.....	18,840	141	11,651,285	87,381
King, or spring.....	4,008,224	182,192	9,985,338	453,879
Sockeye, red, or blueback.....	89,945	8,095	2,181,595	205,344
Steelhead trout.....	891,202	53,476	1,048,082	62,889
Total.....	5,939,047	277,922	31,706,594	1,051,677
<b>Reef nets:</b>				
Coho, or silver.....			22,584	941
Chum, or keta.....			8,944	168
Humpback, or pink.....			92,952	697
King, or spring.....			5,016	228
Sockeye, red, or blueback.....			6,790	611
Steelhead trout.....			2,500	150
Total.....			138,786	2,795
<b>Set nets:</b>				
Coho, or silver.....	1,776	77	570,174	23,730
Chum, or keta.....	3,832	72	399,776	7,495
Humpback, or pink.....	1,732	13	153,852	1,154
King, or spring.....	40,216	1,828	434,852	19,766
Sockeye, red, or blueback.....	9,870	888	31,130	2,802
Steelhead trout.....	11,790	717	20,030	1,212
Total.....	69,216	3,595	1,609,814	56,159
<b>Bag nets:</b>				
Coho, or silver.....			3,600	150
Humpback, or pink.....			2,100	16
Total.....			5,700	166
<b>Wheels:</b>				
King, or chinook.....	128,436	5,838	128,436	5,838
Sockeye, red, or blueback.....	107,305	9,657	107,305	9,657
Steelhead trout.....	30,560	1,834	30,560	1,834
Total.....	266,301	17,329	266,301	17,329
<b>Lines:</b>				
Coho, or silver.....	90,000	3,750	570,000	23,750
King, or spring.....	440,000	20,000	3,520,000	160,000
Total.....	530,000	23,750	4,090,000	183,750
<b>Grand total:</b>				
Coho, or silver.....	1,012,206	42,176	10,720,401	382,148
Chum, or keta.....	588,592	11,036	14,180,872	264,592
Humpback, or pink.....	167,116	1,253	29,644,561	222,331
King, chinook, or spring.....	9,167,334	416,711	19,884,530	902,575
Sockeye, red, or blueback.....	295,900	26,630	5,187,130	532,384
Steelhead trout.....	1,713,314	102,993	2,023,979	121,635
Total.....	12,944,462	600,799	81,641,473	2,425,665

## CATCH OF SALMON IN OREGON IN 1915, BY WATERS AND SPECIES.

Species.	Columbia River.		Coastal streams.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Blueback.....	264,770	\$13,239	696	\$35	265,466	\$13,274
Chum.....	1,561,337	24,396	518,574	8,103	2,079,911	32,499
Chinook.....	20,515,436	1,230,926	3,024,430	151,222	23,539,866	1,382,148
Silverside.....	2,493,650	87,278	2,102,602	63,178	4,596,252	150,456
Steelhead.....	2,279,202	136,752	62,656	3,759	2,341,858	140,511
Total.....	27,114,395	1,492,591	5,708,958	226,297	32,823,353	1,718,888

## CATCH OF SALMON IN CALIFORNIA IN 1915, BY WATERS AND SPECIES.

Location.	Chinook.		Silvers.		Steelhead.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Eel, Mad, Klamath, and Smith Rivers.....	1,649,189	\$82,460	286,719	\$14,336	33,206	\$1,992	1,969,114	\$98,788
Fort Bragg, Mendocino County.....	56,247	2,812	-----	-----	-----	-----	56,247	2,812
San Francisco Bay and tributaries.....	3,471,624	173,581	-----	-----	-----	-----	3,471,624	173,581
Monterey Bay.....	3,035,446	151,772	10,000	500	-----	-----	3,045,446	152,272
Total.....	8,212,506	410,625	296,719	14,836	33,206	1,992	8,542,431	427,453

## PACK OF CANNED SALMON IN 1915.

The following table shows by sections, species, and styles of can the pack of Pacific coast (exclusive of Siberia and Japan) canned salmon in 1915:

Species, grades, and sizes.	Alaska.	Puget Sound.	Queets River.	Sole-duck River.	Quinault River.	Grays Harbor.	Willapa Harbor.	Columbia River.
Coho, or silver:	Cases.	Cases.	Cases.	Cases.	Cases.	Cases.	Cases.	Cases.
1-pound flat.....	4,201	38,196	-----	126	2,848	-----	-----	12,757
1-pound flat.....	2,338	28,765	-----	20	409	4,328	-----	3,381
1-pound tall.....	120,031	113,822	-----	1,300	853	6,860	4,008	17,198
Total.....	126,570	180,783	-----	1,320	1,388	14,036	4,008	33,336
Chinook, or king, red:								
Fancy—								
1-pound flat.....	-----	4,540	-----	-----	-----	-----	-----	168,383
1-pound flat.....	-----	6,692	-----	-----	-----	-----	-----	161,171
1-pound tall.....	-----	15,260	-----	-----	-----	-----	-----	17,650
1-pound oval.....	-----	-----	-----	-----	-----	-----	-----	1,807
Standard—								
1-pound flat.....	4,111	-----	-----	127	458	-----	-----	22,429
1-pound flat.....	3,735	-----	-----	22	630	-----	492	14,819
1-pound tall.....	77,848	-----	-----	388	71	685	2,656	30,227
Total.....	85,694	26,492	-----	388	220	1,773	3,148	416,486
Chinook, or king, white:								
1-pound flat.....	-----	1,038	-----	-----	155	169	-----	-----
1-pound flat.....	-----	-----	-----	26	88	777	-----	-----
1-pound tall.....	-----	936	-----	800	681	1,500	-----	-----
Total.....	-----	1,974	-----	826	924	2,446	-----	-----

Species, grades, and sizes.	Alaska.	Puget Sound.	Queets River.	Sole-duck River.	Qui-nault River.	Grays Harbor.	Wil-lapa Harbor.	Colum-bia River.
Chum, or keta:	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>
½-pound flat.....		1,368						4,026
1-pound flat.....	317	1,878		12	8	37		9,278
1-pound tall.....	484,091	408,528		180	1,985	22,700	5,686	73,226
Total.....	484,408	411,774		192	1,993	22,737	5,686	86,530
Humpback, or pink:								
½-pound flat.....	4,321	26,919						
1-pound flat.....	3,508	11,680						
1-pound tall.....	1,862,544	545,050						
Total.....	1,870,373	583,649						
Sockeye, or red:								
2-pound nominals.....	1,529							
½-pound flat.....	53,965	55,411	344		19,532			4,709
1-pound flat.....	111,698	8,476	200		3,085			
1-pound tall.....	1,755,104	697	968		355			750
Total.....	1,922,296	64,584	1,512		22,972			5,459
Steelhead trout:								
½-pound flat.....								6,836
1-pound flat.....								8,935
1-pound tall.....								10,952
Total.....								26,723
Grand total.....	4,489,341	1,269,256	1,512	2,726	27,497	40,992	12,842	568,534

Species, grades, and sizes.	Nehalem River.	Tillamook Bay.	Nes-tugga River.	Siletz River.	Alsea Bay and River.	Sius-law River.	Ump-qua River.	Coos Bay and River.	Co-quille River.
Coho, or silver:	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>
½-pound flat.....	200		1,900	1,525	1,640	346	949	1,050	1,366
1-pound flat.....				213				2,000	
1-pound tall.....	1,400	4,949	2,100	1,000	1,600	1,409	3,039	450	3,765
Total.....	1,600	4,949	4,000	2,525	3,453	1,755	3,988	3,500	5,131
Chinook, or king, red:									
Standard—									
½-pound flat.....									1,795
1-pound flat.....	200	250	190	103	155		76		
1-pound tall.....	600	5,425		1,400	1,209		1,030		484
1-pound oval.....			1,481						
Total.....	800	5,675	1,671	1,503	1,364		1,106		2,279
Chum, or keta: 1-pound tall..	500	10,599	460	650	50				5,131
Grand total.....	2,900	21,223	6,131	4,678	4,867	1,755	5,094	3,500	12,541

Species, grades, and sizes.	Rogue River.	Smith River.	Klamath River.	Sacramento River.	Monte-rey Bay.	British Columbia.	Total.
<b>Coho, or silver:</b>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>
1-pound flat.....	515	788	2,500			67,683	135,575
1-pound flat.....						15,521	59,990
1-pound tall.....		290				63,752	347,826
Total.....	515	1,078	2,500			146,956	543,391
<b>Chinook, or king, red:</b>							
Fancy—							
1-pound flat.....	1,643						174,566
1-pound flat.....	17,451						185,314
1-pound tall.....							32,910
1-pound oval.....							1,807
Standard—							
1-pound flat.....		1,295			750	35,310	66,275
1-pound flat.....			10,400	5,679	100	1,327	38,178
1-pound tall.....		660		500	100	14,492	137,775
1-pound oval.....						206	206
1-pound oval.....						399	1,880
Total.....	19,094	1,955	10,400	6,179	950	51,734	638,911
<b>Chinook, or king, white:</b>							
1-pound flat.....						289	1,651
1-pound flat.....						524	1,415
1-pound tall.....						5,557	9,474
Total.....						6,370	12,540
<b>Chum, or keta:</b>							
1-pound flat.....							5,394
1-pound flat.....						2,739	14,269
1-pound tall.....						79,261	1,093,047
Total.....						82,000	1,112,710
<b>Humpback, or pink:</b>							
1-pound flat.....						76,072	107,312
1-pound flat.....						26,290	41,478
1-pound tall.....						264,990	2,672,584
Total.....						367,352	2,821,374
<b>Sockeye, or red:</b>							
1-pound oval.....						3,737	3,737
1-pound oval.....						1,579	1,579
2-pound nominals.....							1,529
1-pound flat.....						335,705	469,666
1-pound flat.....						44,225	167,684
1-pound tall.....						90,796	1,848,670
Total.....						476,042	2,492,865
<b>Steelhead trout:</b>							
1-pound flat.....						978	7,814
1-pound flat.....						273	9,208
1-pound tall.....						1,676	12,628
Total.....						2,927	29,650
Grand total.....	19,609	3,033	12,900	6,179	950	1,133,381	7,651,441

## X. STATISTICAL DATA FOR OTHER YEARS.

### CANNING INDUSTRY OF PACIFIC COAST FROM 1864 TO 1915.

From the beginning of the canning of salmon on this coast it has been the most important branch of the industry, and the following table shows in condensed form the number of cases packed in each year on the Pacific coast of North America from the beginning of the industry in 1864 to 1915.

As British Columbia is a province of the Dominion of Canada it does not come strictly within the scope of this report, but in order to show the pack of canned salmon on the North American shores of the Pacific Ocean, which would be incomplete without that of the province, it has been included also.

#### PACK OF CANNED SALMON ON THE PACIFIC COAST, BY YEARS AND WATERS.

Years.	Puget Sound.	Coastal streams of Washington.	Grays Harbor.	Willapa Harbor.	Columbia River.	Coastal streams of Oregon.	Smith River, Cal.
	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>
1866.....					4,000		
1867.....					18,000		
1868.....					28,000		
1869.....					100,000		
1870.....					150,000		
1871.....					200,000		
1872.....					250,000		
1873.....					250,000		
1874.....					350,000		
1875.....					375,000		
1876.....					450,000		
1877.....	5,500				380,000	7,804	
1878.....	288		5,420		460,000	16,634	4,277
1879.....	1,300				480,000	8,571	
1880.....	5,100				530,000	7,772	7,500
1881.....	8,500				550,000	12,320	
1882.....	7,900				541,300	19,186	
1883.....	1,500				629,400	16,156	
1884.....	5,500				620,000	12,376	5,500
1885.....	12,000				553,800	9,370	1,550
1886.....	17,000				448,500	49,147	
1887.....	22,000				356,000	73,996	
1888.....	21,975		37,000	22,500	372,477	92,863	2,347
1889.....	11,674				309,835	98,800	
1890.....	8,000				435,774	47,009	
1891.....	20,529		500	8,000	398,953	24,500	
1892.....	26,426		16,500	14,500	487,338	83,600	
1893.....	89,774		22,000	16,195	415,876	52,778	2,000
1894.....	95,400		21,400	15,100	490,100	54,815	2,000
1895.....	179,968		11,449	22,600	634,696	77,878	2,250
1896.....	195,664		21,274	24,941	481,697	87,360	
1897.....	494,026		13,300	29,600	552,721	60,158	
1898.....	400,200		12,100	21,420	487,944	75,679	
1899.....	919,611		24,240	21,514	332,774	82,041	
1900.....	469,450		30,800	26,300	358,772	12,237	
1901.....	1,380,590		41,500	34,000	390,183	58,618	
1902.....	581,659		31,500	39,492	317,143	44,236	
1903.....	478,488			5,890	339,577	54,861	
1904.....	291,488		27,559	26,400	395,104	98,874	
1905.....	1,018,641		22,050	14,950	397,273	89,055	
1906.....	430,602		22,000	14,440	394,898	107,332	
1907.....	698,080		14,000	13,382	324,171	79,712	
1908.....	448,765		14,000	20,457	253,341	52,478	
1909.....	1,632,949		19,787	12,024	274,087	58,169	
1910.....	567,883		51,130	14,508	391,415	103,617	
1911.....	1,551,028	18,431	75,941	25,497	543,331	138,152	
1912.....	416,125	19,914	47,287	28,148	285,666	84,074	
1913.....	2,583,463	13,124	19,895	12,050	266,479	38,492	
1914.....	817,354	21,459	32,434	16,837	454,621	106,617	3,000
1915.....	1,269,206	31,735	40,992	12,842	558,534	80,499	3,033
Total.....	17,185,556	104,663	676,058	513,387	19,068,830	2,277,776	33,457

## PACK OF CANNED SALMON ON THE PACIFIC COAST, BY YEARS AND WATERS—Con.

Years.	Klamath River, Cal.	Eel River, Cal.	Sacramento River.	Alaska.	British Columbia.	Total.
	Cases.	Cases.	Cases.	Cases.	Cases.	Cases. <sup>a</sup>
1864.....			2,000			2,000
1865.....			2,000			2,000
1866.....						4,000
1867.....						18,000
1868.....						28,000
1869.....						100,000
1870.....						150,000
1871.....						200,000
1872.....						250,000
1873.....						250,000
1874.....			2,500			352,500
1875.....			3,000			378,000
1876.....			10,000		7,247	467,247
1877.....		8,500	21,500		58,387	481,691
1878.....		10,500	34,017	8,159	89,946	629,191
1879.....			13,855	12,530	61,093	577,349
1880.....		6,250	62,000	6,539	61,849	687,010
1881.....			181,200	8,977	169,576	930,573
1882.....			200,000	21,745	240,461	1,030,592
1883.....		15,000	123,000	48,337	163,438	981,831
1884.....		8,200	81,450	64,886	123,706	907,918
1885.....		5,750	90,000	83,415	108,517	857,042
1886.....		12,500	39,300	142,065	152,964	848,976
1887.....			36,500	206,677	204,083	899,256
1888.....	4,400		68,075	412,115	184,040	1,217,792
1889.....			57,300	719,196	417,211	1,614,066
1890.....			25,065	682,591	411,257	1,609,696
1891.....			10,353	801,400	314,511	1,578,746
1892.....	1,047		2,281	474,717	248,721	1,354,083
1893.....	1,600		23,336	643,654	610,202	1,876,915
1894.....	1,700		28,463	686,440	492,232	1,887,150
1895.....	1,600		25,185	626,530	587,692	2,169,848
1896.....			13,387	966,707	617,782	2,408,812
1897.....			38,543	909,078	1,027,183	3,124,609
1898.....			29,731	965,097	492,551	2,484,722
1899.....	1,600		32,580	1,078,146	765,519	3,257,825
1900.....			39,304	1,548,139	606,540	3,091,542
1901.....			17,500	2,016,804	1,247,212	5,186,407
1902.....	2,500		14,043	2,536,824	627,161	4,194,558
1903.....			8,200	2,246,210	473,847	3,607,073
1904.....	3,400		14,407	1,953,756	465,894	3,276,882
1905.....			2,780	1,894,516	1,167,822	4,607,087
1906.....				2,219,044	629,460	3,817,776
1907.....				2,169,873	547,459	3,522,506
1908.....				2,606,973	566,303	3,962,317
1909.....	5,633			2,395,477	993,060	5,393,670
1910.....	8,016	6,000		2,413,054	760,830	4,316,453
1911.....	7,604	8,400	4,142	2,823,817	948,965	6,145,308
1912.....	18,000	11,000		4,054,641	996,576	5,961,431
1913.....	6,376		950	3,739,185	1,353,901	8,033,915
1914.....	11,000		17,315	4,056,653	1,111,039	6,648,325
1915.....	12,900		7,129	4,489,016	1,133,381	7,639,267
Total.....	86,329	50,650	1,382,391	52,732,983	21,239,618	115,021,957

<sup>a</sup> Reduced to a common basis of forty-eight 1-pound cans to the case.<sup>b</sup> Includes 950 cases packed at Monterey.

## CANNING INDUSTRY, BY SPECIES AND WATERS.

The tables which follow show separately, by waters and as far as possible by species, the salmon canned on the Pacific coast from the beginning of the industry until 1915. It is only within recent years that the published statistics have shown the pack of the different species separately. In the early years of canning the chinook, or quinnat, salmon was used exclusively, the other species not being utilized until the chinook had begun to decrease in abundance, or a demand had arisen for a cheaper product. There is a very great difference

in the selling value of the highest and lowest grades, and it is necessary to have complete statistical data now in order intelligently to comprehend the trend of the industry. While every effort has been made to make these tables complete, there are, unfortunately, some gaps which it was found impossible to fill. Such ellipses indicate that either the canneries did not operate or that no data were available for such periods.

Trade names of each species as known in each district, follow:

Districts.	1	2	3	4	5
Alaska.....	Red.....	King.....	Coho..... Medium red. Silver.	Pink.....	Chum. Keta.
British Columbia.....	Sockeye.....	Spring.....	Coho.....	Humpback.....	Chum.
Puget Sound.....	do.....	Tyce, spring.	do.....	do.....	Do.
Columbia River.....	Blueback.....	Chinook.....	Silverside.....	None packed..	Do.
Outside rivers.....	Quinnat.....	Quinnat.....	do.....	do.....	Do.

Although there are only five species of salmon found on the Pacific coast, each bears several common names which are in general use in one or more of the many fishing districts.

#### PACK OF CANNED SALMON ON PUGET SOUND IN SPECIFIED YEARS.

Years.	Can- neries oper- ated.	Chinook.		Sockeye.		Medium red, or silver.	
		Cases..	Value.	Cases.	Value.	Cases.	Value.
1877.....	1					5,000	
1878.....	1					238	
1879.....	1					1,300	\$5,690
1880.....	1						
1881.....	1						
1882.....	1						
1883.....	1						
1884.....	1						
1885.....	4						
1886.....	2	240	\$1,200			7,450	37,400
1890.....	1	1,000	5,000			3,000	15,000
1891.....	2	382	2,101	5,538	\$24,921	5,869	19,368
1892.....	2	86	473	2,954	11,816	7,206	24,500
1893.....	3	1,200	6,450	47,852	103,371	11,812	59,060
1894.....	3			41,781	188,014	22,418	89,672
1895.....	7	1,542	7,325	65,143	273,108	50,865	154,218
1896.....	11	13,495	67,475	72,979	350,299	82,640	264,448
1897.....	12	9,500	39,045	312,048	1,248,192	91,900	282,133
1898.....	18	11,200	50,624	252,000	1,058,400	98,600	335,240
1899.....	19	24,364	103,180	499,646	2,368,334	111,387	418,176
1900.....	19	22,350	134,100	229,800	1,149,000	128,200	512,800
1901.....				1,220,000			
1902.....	21	30,049	150,245	372,301	2,047,655	85,817	429,085
1903.....	22	14,500	72,500	167,211	1,003,260	103,450	413,800
1904.....	13	14,441	69,352	109,264	653,871	118,127	447,851
1905.....	24	1,804	9,922	825,453	4,952,718	79,335	337,174
1906.....	16	8,139	48,834	178,748	1,251,236	94,497	472,485
1907.....	14	1,814	16,326	93,122	698,416	119,472	476,288
1908.....	11	95,210	666,470	170,951	1,196,657	128,922	644,922
1909.....	24	13,019	72,604	1,097,904	6,183,300	143,133	630,446
1910.....	15	10,064	60,324	248,014	1,673,095	162,755	895,153
1911.....	21	21,823	172,582	127,769	1,168,145	256,123	1,711,178
1912.....	21	20,252	101,706	184,680	1,660,173	149,727	761,200
1913.....	32	1,234	5,247	1,673,099	10,871,178	61,019	235,372
1914.....	22	27,140	179,532	339,787	2,751,832	158,933	715,995
1915.....	40	28,466	145,555	64,584	676,769	180,783	902,335



## PACK OF CANNED SALMON ON PUGET SOUND IN SPECIFIED YEARS—Continued.

Years.	Can- neries oper- ated.	Chum.		Pink.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1877.....	1			500		5,500	
1878.....	1					238	
1879.....	1					1,300	\$5,690
1880.....	1					5,100	
1881.....	1					8,500	
1882.....	1					7,900	
1883.....	1					1,500	
1884.....	1					5,500	
1885.....						12,000	
1886.....						17,000	
1887.....						22,000	
1888.....	4					21,975	126,356
1889.....	2	1,145	\$3,435	2,809	\$7,584	11,674	49,619
1890.....	1	4,000	12,000			8,000	32,000
1891.....	2	3,093	10,825	5,647	15,246	20,529	72,461
1892.....	2	16,180	56,630			26,426	93,419
1893.....	3	11,380	31,295	17,530	47,331	89,774	247,537
1894.....	3	22,152	60,918	9,049	21,432	95,400	363,036
1895.....	7	38,785	94,741	23,633	62,556	179,968	591,948
1896.....	11	26,550	73,013			195,664	755,235
1897.....	12	23,310	64,103	57,268	171,804	494,026	1,805,277
1898.....	18	38,400	105,600			400,200	1,549,864
1899.....	19	31,481	86,427	252,733	734,241	919,611	3,710,358
1900.....	19	89,100	245,025			469,450	1,940,925
1901.....						1,380,590	
1902.....	21	93,492	467,460			581,659	3,094,445
1903.....	22	12,001	30,002	181,326	407,984	478,488	1,927,546
1904.....	13	49,656	124,254			291,488	1,295,328
1905.....	24	41,057	102,643	70,992	212,976	1,018,641	5,615,433
1906.....	16	149,218	708,781			430,602	2,481,336
1907.....	14	50,219	150,847	433,423	1,300,269	698,080	2,642,146
1908.....	11	47,607	142,821	6,075	18,225	448,765	2,669,095
1909.....	24	53,688	128,916	370,993	902,342	1,632,949	7,917,608
1910.....	15	146,942	514,297	108	388	567,883	3,143,256
1911.....	21	98,321	391,123	1,016,992	4,302,344	1,551,028	7,745,372
1912.....	21	60,760	154,193	700	2,185	416,125	2,679,457
1913.....	32	56,225	121,970	791,886	2,092,401	2,583,463	13,329,168
1914.....	22	290,477	903,675	1,017	4,615	817,354	4,555,649
1915.....	40	411,724	1,155,474	583,649	1,795,285	1,269,206	4,675,418

## PACK OF CANNED SALMON ON QUEETS RIVER IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Sockeye.		Silverside.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1912.....	1	750	\$4,500	200	\$2,080	2,500	\$11,500
1913.....	1	1,082	7,574	220	1,848	1,680	5,712
1914.....	1	1,175	5,875	200	2,134	1,800	6,966
1915.....	1			1,512	9,072		

Years.	Canneries operated.	Chum.		Steelhead.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1912.....	1	1,000	\$2,400			4,450	\$20,480
1913.....	1	670	1,461	600	\$3,300	4,252	19,895
1914.....	1	1,020	2,887	500	2,750	4,695	20,612
1915.....	1					1,512	9,072

## CANNED SALMON PACK ON SOLEDUCK RIVER IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook, or black.		Sockeye.		Siverside.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1912.....	1	414	\$2,484	15	\$156	940	\$4,324
1913.....	1	206	1,442			1,040	3,536
1914.....	1	237	1,185			1,439	5,574
1915.....	1	388	1,940			1,320	6,072

Years.	Canneries operated.	Pink. <sup>a</sup>		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1912.....	1	103	\$268	76	\$182	1,548	\$7,414
1913.....	1			28	61	1,274	5,039
1914.....	1	189	567	103	291	1,968	7,617
1915.....	1	826	2,478	192	538	2,726	11,028

<sup>a</sup> These are virtually all light-colored chinooks.

## PACK OF CANNED SALMON ON QUINAULT RIVER IN SPECIFIED YEARS.

Years.	Canneries operated.	Chinook.		Sockeye.		Siverside.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1911 <sup>a</sup> .....	1	5,000	\$35,000	2,031	\$16,000	6,000	\$42,000
1912.....	2			4,500	40,500	3,916	18,014
1913.....	1			<sup>b</sup> 22,397	188,135	7,106	24,160
1914.....	2	51	255	12,074	120,740	1,623	6,281
1915.....	2	1,144	6,864	22,972	239,989	1,388	6,807

Years.	Canneries operated.	Chum.		Total.	
		Cases.	Value.	Cases.	Value.
1911 <sup>a</sup> .....	1	5,400	\$27,000	18,431	\$120,000
1912.....	2	5,500	13,200	13,916	71,714
1913.....	1			7,598	212,295
1914.....	2	1,048	2,966	14,796	130,242
1915.....	2	1,993	5,580	27,497	259,240

<sup>a</sup> Previous to this date the fish were transported to the Aberdeen and Hoquiam canneries and prepared there.<sup>b</sup> The greater portion of these were brought to Aberdeen and canned.

## PACK OF CANNED SALMON ON GRAYS HARBOR IN SPECIFIED YEARS.

Years.	Can- neries oper- ated.	Chinook.		Siverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1878.....	1							5,420	\$29,268
1879.....	1								
1885.....								8,200	
1886.....								18,700	
1888.....	4							37,000	212,750
1891.....	1			500	\$1,500			500	1,500
1892.....	1	4,500	\$15,390	9,000	30,780	3,000	\$9,415	16,500	55,585
1893.....	1	4,500	22,500	12,000	48,000	5,500	14,850	22,000	85,350
1894.....	1	12,300	61,500	4,100	16,400	5,000	13,500	21,400	91,400
1895.....	1	56	202	8,876	28,403	2,517	6,922	11,449	35,527
1896.....	2	7,816	36,806	9,278	29,689	4,180	11,495	21,274	57,990
1897.....	1	3,100	11,741	8,300	23,481	1,900	5,000	13,300	40,222
1898.....	2	5,100	23,052	4,800	16,320	2,200	6,050	12,100	45,422
1899.....	1	5,000	21,250	15,740	59,025	3,500	8,750	24,240	89,025
1900.....	2	6,700	33,500	12,900	51,600	11,200	30,800	30,800	115,900
1901.....								41,500	
1902.....	1	4,000	20,000	10,000	45,000	17,500	70,000	31,500	135,000
1904.....	2	4,339	20,163	14,904	51,854	8,316	21,022	27,559	93,039
1905.....	2	2,050	9,225	13,000	52,000	7,000	18,200	22,050	79,425
1906.....	2	2,500	10,000	11,500	43,900	8,000	21,500	22,000	75,400
1907.....	1	1,000	7,000	9,500	47,500	3,500	11,500	14,000	66,000
1908.....	1	1,000	7,000	9,500	47,500	3,500	11,500	14,000	66,000
1909.....	1	5,721	20,819	9,019	38,146	5,047	11,608	a 19,787	70,573
1910.....	3	15,495	90,718	21,768	108,840	13,867	48,534	b 51,130	248,092
1911.....	4	15,773	110,411	28,991	202,937	c 31,177	155,885	75,941	469,233
1912.....	5	9,060	54,360	26,162	120,345	12,065	28,956	47,287	203,661
1913.....	4	1,253	8,771	5,723	19,458	12,919	28,163	19,895	56,392
1914.....	4	11,899	59,495	9,156	35,434	11,379	32,203	32,434	127,132
1915.....	4	4,219	20,089	14,036	61,707	22,737	63,678	40,992	145,474

a Also 1,649 cases, valued at \$9,051, with sockeyes brought from Puget Sound.

b Also 4,350 cases of "Quinault," or sockeye, salmon.

c Includes 6,730 cases of humpbacks.

## PACK OF CANNED SALMON ON WILLAPA HARBOR IN SPECIFIED YEARS.

Years.	Can- neries opera- ted.	Chinook or black.		Siverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1886.....	4							13,600	
1887.....									
1888.....	3							22,500	\$129,375
1891.....	1			8,000	\$24,000			8,000	24,000
1892.....	1	3,000	\$10,260	9,000	30,780	2,500	\$7,745	14,500	48,785
1893.....	1	1,700	9,180	7,895	31,580	6,600	18,150	16,195	58,910
1894.....	1	2,700	14,580	5,600	22,400	6,800	18,700	15,100	55,680
1895.....	2	4,636	23,180	13,047	41,150	4,917	13,222	22,600	77,552
1896.....	2	4,551	22,755	11,940	38,208	8,450	21,238	24,941	82,201
1897.....	1	8,100	33,291	14,600	44,822	6,900	18,975	29,600	97,088
1898.....	2	5,865	26,510	9,809	33,351	5,746	15,802	21,420	75,663
1899.....	3	5,650	25,425	10,675	40,031	4,989	13,720	21,314	79,176
1900.....	3	6,700	33,500	12,400	49,600	7,200	19,800	26,300	102,900
1901.....								34,000	
1902.....	2	5,836	29,186	9,128	41,076	24,528	97,112	39,462	167,368
1903.....	1	2,300	13,800	2,390	10,755	1,200	3,300	5,890	27,855
1904.....	2	3,000	12,000	7,400	28,440	16,000	38,700	26,400	79,140
1905.....	2	4,650	20,925	4,300	17,200	6,000	15,000	14,950	53,125
1906.....	2	4,000	16,000	5,340	21,360	5,100	13,260	14,440	50,620
1907.....	2	3,530	15,354	9,228	36,682	624	2,496	13,382	54,532
1908.....	2	4,017	20,585	5,923	23,692	10,517	36,809	20,457	81,086
1909.....	1	1,455	5,869	4,822	17,359	5,747	13,163	12,024	36,391
1910.....	1	2,923	15,077	5,096	25,480	3,489	22,711	14,508	63,268
1911.....	2	5,717	40,019	9,298	65,086	10,482	52,410	25,497	157,515
1912.....	3	6,123	36,738	8,030	36,938	9,533	22,879	a 28,148	108,156
1913.....	2	67	469	3,111	10,577	8,872	19,365	12,050	30,414
1914.....	3	2,924	14,431	7,179	27,749	6,734	19,077	16,537	61,256
1915.....	2	3,148	19,380	4,008	18,437	5,686	15,921	12,842	53,738

a Includes 4,462 cases of humpbacks, valued at \$11,601.

## PACK OF CANNED SALMON ON THE COLUMBIA RIVER FROM THE INCEPTION OF THE INDUSTRY TO 1915.

Years.	Can- neries oper- ated.	Chinook.		Blueback.		Silverside.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1866.....	1	4,000	\$61,000				
1867.....	1	18,000	288,000				
1868.....	2	28,000	392,000				
1869.....		100,000	1,350,000				
1870.....		150,000	1,800,000				
1871.....		200,000	2,100,000				
1872.....		250,000	2,325,000				
1873.....		250,000	2,250,000				
1874.....	13	350,000	2,625,000				
1875.....	13	375,000	2,250,000				
1876.....		450,000	2,475,000				
1877.....		380,000	2,052,000				
1878.....	30	460,000	2,300,000				
1879.....	30	480,000	2,640,000				
1880.....	29	530,000	2,650,000				
1881.....	35	550,000	2,475,000				
1882.....		541,300	2,600,000				
1883.....		629,400	3,147,000				
1884.....		629,400	2,915,000				
1885.....		553,800	2,500,000				
1886.....	39	448,500	2,135,000				
1887.....		356,000	2,124,000				
1888.....	28	372,477	2,327,981				
1889.....	21	266,697	1,600,182	17,797	\$101,051		
1890.....	21	335,604	1,946,087	57,345	290,069		
1891.....	22	353,907	2,038,566	15,482	284,242		
1892.....	24	344,267	1,996,388	66,547	372,909	4,176	\$20,880
1893.....	24	288,773	1,559,374	30,459	152,295	29,107	116,428
1894.....	24	351,106	1,895,976	43,814	224,430	42,758	171,032
1895.....	24	444,909	2,428,658	18,015	86,523	99,601	329,683
1896.....	24	370,943	1,840,511	16,983	81,518	44,108	141,145
1897.....	22	432,753	1,804,221	12,972	51,888	63,850	197,762
1898.....	23	321,566	1,490,394	66,670	300,015	65,431	222,465
1899.....	17	255,824	1,458,175	23,969	134,723	29,608	112,055
1900.....	16	262,392	1,821,258	13,162	92,184	44,925	202,163
1901.....							
1902.....	14	270,580	1,428,743	17,037	86,465	10,532	44,732
1903.....	16	301,762	1,610,614	8,383	42,867	12,181	49,869
1904.....	20	320,378	1,944,690	12,911	78,048	31,254	118,357
1905.....	19	327,106	1,962,636	7,768	46,608	26,826	114,011
1906.....	19	311,334	1,868,007	7,816	54,712	41,446	124,338
1907.....	19	258,433		5,504		31,757	
1908.....	14	210,096		8,581		31,432	
1909.....	15	162,131	1,203,546	a 27,908	214,561	42,178	185,070
1910.....	15	244,285	1,882,137	6,234	34,287	68,922	363,688
1911.....	15	405,862	2,204,185	5,988	47,904	79,416	549,478
1912.....	15	220,817	1,988,526	8,210	85,384	31,842	177,248
1913.....	15	192,116	1,664,670	11,152	93,677	40,969	175,412
1914.....	17	289,464	2,573,502	35,311	376,924	69,769	380,666
1915.....	19	406,486	3,694,361	5,459	56,707	33,336	173,234
Total.....							

a Of these, 2,846 cases, valued at \$23,203, were packed with sockeyes brought from Puget Sound.

## PACK OF CANNED SALMON ON THE COLUMBIA RIVER FROM THE INCEPTION OF THE INDUSTRY TO 1915—Continued.

Years.	Can- neries oper- ated.	Chum.		Steelhead trout.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1866.....	1					4,000	\$64,000
1867.....	1					18,000	288,000
1868.....	2					28,000	392,000
1869.....						109,000	1,350,000
1870.....						150,000	1,800,000
1871.....						200,000	2,100,000
1872.....						250,000	2,325,000
1873.....						250,000	2,250,000
1874.....	13					850,000	2,625,000
1875.....	13					375,000	2,250,000
1876.....						450,000	2,475,000
1877.....						380,000	2,052,000
1878.....	30					460,000	2,300,000
1879.....	30					480,000	2,640,000
1880.....	29					530,000	2,650,000
1881.....	35					550,000	2,475,000
1882.....						541,300	2,600,000
1883.....						629,400	3,147,000
1884.....						629,400	2,915,000
1885.....						553,800	2,500,000
1886.....	39					448,500	2,135,000
1887.....						356,000	2,124,000
1888.....	28					372,477	2,234,862
1889.....	21			25,391	\$108,587	309,885	1,809,820
1890.....	21			42,825	171,300	435,774	2,407,456
1891.....	22			29,564	118,156	398,953	2,440,964
1892.....	24			72,348	288,892	487,338	2,679,069
1893.....	24	2,311	\$6,933	65,226	260,904	415,876	2,095,934
1894.....	24			52,422	209,688	490,100	2,501,126
1895.....	24	22,493	62,591	49,678	203,542	634,696	3,110,997
1896.....	24			49,663	198,652	481,697	2,261,826
1897.....	22			46,146	165,440	552,721	2,219,311
1898.....	23			26,277	60,352	487,944	2,073,226
1899.....	17	11,379	33,836	11,994	39,186	332,774	1,777,975
1900.....	16	17,696	63,706	20,597	102,985	358,772	2,282,296
1901.....						390,183	1,942,660
1902.....	14	10,401	41,604	8,593	42,965	317,143	1,644,509
1903.....	16	10,000	37,500	7,251	36,255	339,577	1,777,105
1904.....	20	20,693	52,691	9,868	48,892	395,104	2,242,678
1905.....	19	25,751	65,206	9,822	49,110	397,273	2,237,571
1906.....	19	27,802	69,505	6,500	32,500	394,898	2,149,062
1907.....	19	22,556		5,921		324,171	1,763,490
1908.....	14	16,884		10,726		253,341	1,380,708
1909.....	15	24,542	57,115	17,382	99,796	274,087	1,760,088
1910.....	15	66,538	232,883	5,436	31,203	391,415	2,544,198
1911.....	15	53,471	203,198	8,594	47,399	543,331	3,052,164
1912.....	15	18,699	46,590	6,958	22,108	285,666	2,319,856
1913.....	15	13,303	29,486	8,939	49,142	266,479	2,012,387
1914.....	17	49,285	305,541	10,792	59,356	454,621	3,695,989
1915.....	19	86,530	251,632	26,723	129,358	558,534	4,305,292
Total.....						19,068,830	110,178,619

• 55 cases of humpbacks, valued at \$132, were also packed with humpbacks brought from Puget Sound.

## PACK OF CANNED SALMON ON THE NEHALEM RIVER, OREG., IN SPECIFIED YEARS.

Years.	Can-neries oper-ated.	Chinook.		Siverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1887.	1							5,000	\$30,000
1889.								6,000	32,000
1890.								9,000	45,500
1891.	1							3,500	14,000
1892.	1			10,000	\$40,000			10,000	40,000
1893.	1	1,692	\$6,768	5,031	20,124			6,723	26,892
1891.	1	1,627	6,508	4,866	19,464			6,493	25,972
1895.	1	1,752	7,008	5,152	16,486			6,904	23,494
1896.	1	2,828	8,484	5,218	15,654			8,046	24,138
1897.	2	3,384	10,152	8,366	25,098			11,750	35,250
1898.	1	3,808	9,891	5,700	19,380			9,508	29,271
1899.	1	1,384	5,536	7,405	26,658	1,288	\$3,864	10,077	36,058
1900.	1								
1901.	1	268	1,139	3,273	13,092	2,669	7,206	6,210	21,437
1902.	1	271	1,431	3,169	13,468	2,570	10,280	6,010	25,179
1903.	1	686	3,670	4,615	19,614			5,301	22,284
1904.	1	500	2,500	5,000	20,000	6,000	12,000	11,500	34,500
1905.	1	2,700	16,200	2,900	12,325	6,000	15,000	11,600	43,525
1906.	1	3,987	23,922	4,976	14,928	2,057	5,143	11,020	42,993
1907.	1	4,000	28,000	6,600	19,800	2,000	6,000	12,600	53,800
1908.	1	5,000	35,000	6,100	18,300	2,016	6,048	13,116	59,348
1909.	1	1,985	10,542	4,554	20,253	909	2,091	7,448	32,886
1910.	1	3,500	24,500	5,400	29,700	1,500	4,500	10,400	58,700
1911.	2	5,821	46,568	14,878	81,829	3,439	13,048	24,138	141,445
1912.	2			13,331	73,321	1,571	3,927	14,902	77,248
1913.	1	300	1,500	764	3,056	5	11	1,069	4,567
1914.	2	4,841	32,887	11,800	63,720	1,668	4,170	18,309	101,777
1915.	2	400	2,400	5,400	24,840	2,260	6,328	8,060	33,568

## PACK OF CANNED SALMON ON TILLAMOOK BAY, OREG., IN SPECIFIED YEARS.

Years.	Can-neries oper-ated.	Chinook.		Siverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1884.								4,500	
1885.								9,800	
1886.	2							37,000	
1887.	2							21,000	\$115,500
1888.	2							14,633	84,140
1889.								9,500	52,250
1890.								14,009	79,049
1891.									
1892.	1			18,000	\$72,000			18,000	72,000
1893.	1	497	\$1,988	4,000	16,000	6,919	\$17,297	11,416	35,285
1894.	1	700	2,800	7,763	31,052	700	1,750	9,163	35,602
1895.	1			6,514	20,845	7,001	19,253	13,515	40,098
1896.	1	2,200	6,600	4,860	14,580			7,060	21,180
1897.	1	2,000	6,000	9,000	27,000			11,000	33,000
1898.	1	5,000	13,000	10,342	35,162			15,342	48,162
1899.	1	2,180	8,720	3,889	14,036	5,121	15,363	11,190	38,119
1900.	1								
1901.	1	848	4,240	2,133	9,598	2,901	10,728	6,882	24,566
1902.	1	215	1,135	2,287	9,720	4,093	16,372	6,595	27,227
1903.	1			2,727	11,590	2,620	10,480	5,347	22,670
1904.	1			4,400	17,600	6,500	13,000	10,900	30,600
1905.	1	1,100	6,600	1,700	7,650	8,800	22,000	11,600	36,250
1906.	1	1,870	11,220	2,364	7,092	1,270	3,175	5,504	21,487
1907.	1	2,000	14,000	3,410	10,230	2,314	6,942	7,724	31,172
1908.	1	2,300	16,100	6,000	21,000	4,000	12,000	12,300	49,100
1909.	1	2,615	15,663	5,029	21,809	3,712	8,538	11,356	46,010
1910.	1	2,900	20,300	4,500	24,750	2,000	6,000	9,400	51,050
1911.	2	8,433	67,464	12,663	69,647	5,277	20,053	26,373	157,164
1912.	2	3,811	26,677	6,418	32,090	4,550	11,375	14,779	70,142
1913.	1	2,600	15,600	1,000	4,000	1,000	2,200	4,600	21,800
1914.	2	4,734	33,138	4,131	22,307	6,707	16,867	15,572	72,312
1915.	3	5,675	34,300	4,549	20,925	9,099	25,477	19,323	70,702

## PACK OF CANNED SALMON ON NESTUGGA RIVER, OREG., IN SPECIFIED YEARS.

Years.	Can-neries oper-ated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1887.....	1							4,300	\$23,650
1888.....	1							5,000	23,750
1889.....								6,700	36,850
1891.....	1								
1899.....	1	1,109	\$4,436	3,034	\$10,922	513	\$1,539	4,656	16,897
1900.....	1								
1901.....	1	279	1,116	3,553	13,323	396	1,089	4,228	15,528
1905.....	1	3,000	13,000	1,000	4,250	400	1,000	4,400	23,250
1906.....	1	2,622	15,732	2,468	7,404	165	413	5,255	23,549
1907.....	1	2,100	14,700	3,540	10,620	150	450	5,790	25,770
1908.....	1	2,000	14,000	3,000	10,500	100	300	5,440	24,800
1910.....	1	2,000	14,000	2,300	18,150	140	420	11,327	32,570
1911.....	1	3,562	28,496	7,124	39,182	641	2,436	70,114	51,210
1912.....	1	3,090	18,540	6,180	30,900	708	1,770	9,978	1,728
1913.....	1	126	756	243	972			369	56,308
1914.....	1	3,542	24,794	5,730	30,942	265	662	9,537	21,618
1915.....	1	200	1,300	3,930	18,078	800	2,240	4,930	

## PACK OF CANNED SALMON ON SILETZ RIVER, OREG., IN SPECIFIED YEARS.

Years.	Can-neries oper-ated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1896.....	1	2,500	\$7,500	1,900	\$5,700			4,400	\$13,200
1897.....	1	3,510	10,530	5,015	15,045			8,525	25,575
1898.....	1	3,200	8,360	4,330	14,722			7,530	23,082
1899.....	1	2,200	9,900	2,319	8,696	200	\$550	4,719	19,146
1900.....	1								
1901.....	1	876	4,380	3,740	16,830	360	1,260	4,976	22,470
1902.....	1	600	3,168	1,917	8,147	500	2,000	3,017	13,315
1904.....	1	1,000	5,000	3,300	13,200	1,000	2,000	5,300	20,200
1905.....	1	1,500	9,000	1,700	7,225	900	2,250	4,100	18,475
1906.....	1	2,635	15,810	3,192	9,576	167	418	5,994	25,804
1907.....	1	2,333	16,331	4,300	12,900	200	600	6,833	29,831
1908.....	1	2,100	14,700	4,700	16,450	300	900	7,100	32,050
1910.....	1	2,200	15,400	4,600	25,300	250	750	7,050	41,450
1911.....	1	3,584	28,672	7,164	39,402	237	901	10,985	68,975
1912.....	1	3,277	19,662	6,554	32,770	283	707	10,114	53,139
1913.....	1	15	75	354	1,416	17	37	386	1,528
1914.....	1	3,356	23,492	6,712	36,245	196	490	10,264	60,227
1915.....	1	100	600	3,000	13,800	100	280	3,200	14,680

PACK OF CANNED SALMON ON YAQUINA BAY AND RIVER, OREG., IN SPECIFIED YEARS.<sup>a</sup>

Years.	Can-neries oper-ated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1887.....	2								
1888.....	3								
1889.....								5,088	\$29,256
1891.....								5,000	27,500
1896.....	1	1,714	\$5,142	615	\$1,845			2,329	6,987
1898.....	1	170	442	1,530	5,202			1,700	5,644
1899.....	2	316	1,422	3,234	12,127	1,300	\$3,575	4,850	17,124
1900.....	1								
1901.....	1	96	480	2,848	12,816	549	1,647	3,493	14,943
1903.....	1			1,238	5,262	315	787	1,553	6,049
1904.....	1	50	200	2,600	8,840	450	1,080	3,100	10,120
1905.....	1	200	1,200	2,050	8,613	62	155	2,312	9,968
1906.....	1	500	3,000	3,100	9,300	60	150	3,660	12,450
1907.....	1	834	5,838	1,000	3,000	49	147	1,883	8,985
1908.....	1			4,000	14,000			4,000	14,000
1909.....	1			1,139	4,556	33	76	1,172	4,632
1910.....	1			2,669	13,345			2,669	13,345
1911.....	1			1,009	5,549	51	289	1,060	5,838

<sup>a</sup> Cannery not operated from 1912 to 1915, both years inclusive.

## PACK OF CANNED SALMON ON ALSEA RIVER AND BAY, OREG., IN SPECIFIED YEARS.

Years.	Can- neries oper- ated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1886.	1								
1887.	2							11,180	\$64,285
1888.	3							9,620	55,315
1889.								10,000	55,000
1891.	1								
1892.	1			3,600	\$14,400			3,600	14,400
1893.	1	1,260	\$6,300	3,240	12,960			4,500	19,260
1894.	1	440	2,200	4,160	16,640			4,600	18,840
1895.	1	1,700	6,375	3,280	11,808			4,980	18,183
1896.	1	3,500	10,500	3,400	10,200			6,900	20,700
1897.	1	1,800	5,400	3,200	9,600			5,000	15,000
1898.	1	4,296	11,170	2,170	7,378			6,466	18,548
1899.	1	2,150	9,138	5,010	19,038			7,160	28,176
1900.	1								
1901.	1	695	3,475	4,629	18,790	891	\$3,118	6,215	25,383
1902.	1	701	3,702	4,530	19,253	670	2,680	5,901	25,635
1903.	1	1,031	5,516	4,242	18,029	44	88	5,317	23,633
1904.	1	1,000	5,000	6,500	26,000	300	600	7,800	31,600
1905.	1	2,500	15,000	1,800	7,650	700	1,750	5,000	24,400
1906.	1	3,702	22,212	3,843	11,529			7,545	33,741
1907.	1	800	5,600	5,100	15,300	350	1,050	6,250	21,950
1908.	1	1,200	8,400	6,000	21,000	400	1,200	7,600	30,600
1909.	1	1,119	6,714	5,486	24,027	80	184	6,685	30,925
1910.	1	2,500	17,500	5,900	31,950	100	300	8,500	49,750
1911.	2	4,161	33,288	9,329	51,309	688	2,614	14,178	87,211
1912.	2	3,731	22,386	8,286	41,430	524	1,310	12,541	65,126
1913.	2	1,607	8,035	4,304	17,216	160	352	6,071	25,603
1914.	2	4,546	31,822	6,728	36,331	73	183	11,347	68,336
1915.	2	1,668	10,763	6,966	32,044	178	498	8,812	43,305

## PACK OF CANNED SALMON ON THE SIUSLAW RIVER, OREG., IN SPECIFIED YEARS.

Years.	Can- neries oper- ated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1878.	2							10,300	\$55,620
1879.	2								
1886.	1							1,500	
1888.	1							11,960	68,770
1889.	1							12,000	66,000
1891.	2								
1892.	2			18,000	\$72,000			18,000	72,000
1893.	2	1,471	\$7,355	11,830	47,320			13,301	54,675
1894.	2	1,871	9,355	14,987	59,948			16,858	69,303
1895.	2	1,637	6,139	10,465	35,274			12,102	41,413
1896.	1	2,700	8,100	9,000	27,000			11,700	35,100
1897.	1	1,100	3,300	3,900	11,700			5,000	15,000
1898.	1	1,850	2,210	10,000	34,000			10,850	36,210
1899.	1	1,162	4,648	7,323	26,363	115	\$345	8,600	31,356
1900.	2								
1901.	1	1,735	8,675	7,488	29,952			9,223	38,627
1902.	1	1,288	6,800	4,320	18,260			5,608	25,060
1903.	1	1,519	8,127	6,842	29,079			8,361	37,206
1904.	1	500	2,500	6,500	26,000			7,000	28,500
1905.	1								
1906.	2	4,500	27,000	15,000	45,000	1,500	3,750	21,000	75,750
1907.	1			15,773	47,319			15,773	47,319
1908.	1			8,600	30,100			8,600	30,100
1909.	2	632	3,792	7,436	32,956			8,068	36,748
1910.	2	856	5,992	12,800	70,400	8,502	25,506	22,158	101,898
1911.	2	1,120	8,960	10,266	56,463	5,000	19,000	16,392	84,423
1912.	2			6,108	30,540			6,108	30,540
1913.	2			4,281	17,124			4,281	17,124
1914.	1			9,266	50,036			9,266	50,036
1915.	1			1,755	8,073			1,755	8,073

\* The two canneries combined and operated one plant.



## PACK OF CANNED SALMON ON THE UMPQUA RIVER, OREG., IN SPECIFIED YEARS.

Years.	Can- neries oper- ated.	Chinook.		Silverside.		Chum.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.	Cases.	Value.
1878.	2							8,100	\$43,740
1879.	2								
1884.	2							3,700	
1885.	1							10,500	
1886.	1							18,600	
1887.	1							4,000	22,000
1888.	1							9,000	51,750
1889.	1							12,000	66,000
1891.	1								
1892.	1			10,000	\$40,000			10,000	40,000
1893.	1	809	\$4,045	3,204	12,816			4,013	16,861
1894.	1	235	1,175	6,875	27,500			7,110	28,675
1895.	1	932	3,720	7,697	28,863			8,689	32,583
1896.	1	1,300	3,900	8,000	24,000			9,300	27,900
1899.	2	925	3,860	7,576	27,006	115	\$345	8,616	31,211
1900.	2								
1903.	1	23	123	6,733	28,615			6,756	28,738
1904.	1	500	2,500	9,500	38,000	500	1,000	10,500	41,500
1905.	1	6,100	36,600	10,500	44,625			16,600	81,225
1906.	1	1,143	6,858	5,613	16,839			6,756	23,697
1909.	1	500	3,000	7,753	31,012			8,253	34,012
1910.	1	2,000	14,000	11,000	60,500			13,000	74,500
1911.	1	300	2,400	6,118	33,649			6,418	36,049
1912.	1	30	210	3,759	18,795			3,789	19,005
1913.	1			398	1,990			398	1,990
1914.	1	1,000	8,000	2,000	10,000			3,000	18,000
1915.	2			5,100	23,460			5,100	23,460

## PACK OF CANNED SALMON ON COOS BAY AND RIVER, OREG., IN SPECIFIED YEARS.

Years.	Can- neries oper- ated.	Chinook.		Silverside.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1887.	2					11,300	\$62,150
1888.	1					5,500	31,625
1889.	1					7,000	38,500
1891.	2						
1893.	1						
1894.	1	163	\$815	3,125	\$12,500	3,125	12,500
1895.	1	5,110	19,163	8,428	33,712	8,591	34,527
1896.	1	13,000	39,000	2,332	8,934	7,442	28,097
1897.	1	6,200	18,600	2,000	6,000	15,000	45,000
1898.	1	3,142	8,169	2,200	6,600	8,400	25,200
1899.	2	1,273	5,092	7,180	24,412	10,322	32,581
1900.	2			5,174	18,626	6,447	23,718
1901.	1	1,215	6,075	4,082	16,328	5,297	22,403
1902.	1	412	2,175	2,640	11,220	3,052	13,395
1904.	1	2,033	7,725	7,200	24,480	9,233	32,205
1906.	1	2,043	12,258	1,755	5,265	3,798	17,523
1909.	1	275	1,475	3,959	17,927	4,234	19,402
1910.	1	500	3,500	5,500	30,250	6,000	33,750
1911.	2	2,630	21,040	7,260	39,930	9,890	60,970
1912.	2	1,457	10,199	3,989	19,945	5,446	30,144
1913.	2			7,383	29,532	7,383	29,532
1914.	1			9,300	50,220	9,300	50,220
1915.	1			3,500	16,100	3,500	16,100

## PACK OF CANNED SALMON ON THE COQUILLE RIVER, OREG., IN SPECIFIED YEARS.

Years.	Can-neries oper-ated.	Chinook.		Silverside.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1883.	1					7,000	
1884.	1					7,300	
1885.	1					3,800	
1886.	2					8,300	
1887.	3						
1888.	2					11,000	\$63,250
1889.						8,600	47,300
1891.	1						
1892.	1			5,000	\$20,000	5,000	20,000
1893.	1			6,500	26,000	6,500	26,000
1894.	a 1			2,000	8,000	2,000	8,000
1895.	2	760	\$2,887	8,724	32,615	9,484	35,502
1896.	2	1,225	3,675	7,800	23,400	9,025	27,075
1898.	2	541	1,407	7,485	25,499	8,026	26,906
1899.	2	950	3,800	7,550	28,500	8,500	32,300
1900.	1	2,636	13,180	9,601	38,404	12,237	51,584
1901.	1	133	665	5,096	20,384	5,229	21,049
1902.	1	286	1,510	5,877	24,927	6,163	26,437
1903.	1	331	1,771	8,685	36,911	9,016	38,682
1904.	2	600	2,400	13,686	54,744	14,286	57,144
1905.	2	2,100	12,600	11,343	48,208	13,443	60,808
1906.	2	821	4,926	17,979	53,937	18,800	58,863
1907.	2	306	2,142	13,220	39,660	13,526	41,802
1908.	2			19,174	67,109	19,174	67,109
1909.	2	250	1,255	9,818	42,687	10,068	43,942
1910.	2	420	2,940	16,637	91,504	17,057	94,444
1911.	2	715	5,720	16,676	91,718	17,391	97,438
1912.	2	377	2,639	6,040	30,200	6,417	32,839
1913.	2			8,910	35,640	8,910	35,640
1914.	2			12,097	65,324	12,097	65,324
1915.	2	1,079	6,474	5,131	25,515	6,210	31,989

a Burned.

PACK OF CANNED SALMON ON ROGUE RIVER, OREG., IN SPECIFIED YEARS.<sup>a</sup>

Years.	Can-neries oper-ated.	Chinook.		Silverside.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1877.	1					7,804	
1878.	1					8,534	
1879.	1					8,571	
1880.	1					7,772	
1881.	1					12,320	
1882.	1					19,186	
1883.	1					16,156	
1884.	1					12,376	
1885.	1					9,310	
1886.	1					12,147	
1887.	1					17,216	
1888.	1					21,062	\$121,107
1889.	1					22,000	132,000
1890.	1					24,000	120,000
1891.	1					21,000	105,000
1892.	1	10,000	\$59,000	9,000	\$36,000	19,000	95,000
1893.	b 1	3,200	16,000			3,200	16,000
1895.	1	10,377	41,508	4,385	15,347	14,762	56,855
1896.	1	15,000	75,000	3,000	9,000	18,000	84,000
1897.	1	15,355	61,420	3,653	10,959	19,008	72,379
1898.	1	12,964	51,550	501	1,303	13,465	52,853
1899.	1	5,481	30,145	1,745	6,980	7,226	37,125
1900.	1						
1901.	1	2,681	13,405	4,184	17,736	6,865	31,141
1902.	1	3,799	20,058	4,091	17,387	7,890	37,445
1903.	1	8,418	45,036	4,792	20,366	13,210	65,402
1904.	1	16,000	64,000	3,255	11,392	19,255	75,392
1905.	1	18,500	111,000	1,500	6,375	20,000	117,375
1906.	1	12,000	72,000	6,000	18,000	18,000	90,000
1907.	1	7,537	56,528	1,796	8,980	9,333	65,508
1908.	1	4,354	32,655	2,650	13,250	6,004	45,905
1909.	1	186	1,300	699	2,977	885	4,277
1910.	1	232	1,788	2,711	16,266	1,943	18,052
1913.	1	3,020	27,160	2,403	11,857	5,423	39,017
1914.	1	6,938	62,060	987	5,453	7,925	67,513
1915.	2	19,094	135,301	515	2,389	19,609	137,670

<sup>a</sup> Shut down in 1911 and 1912 through the closing of the river to all fishing.<sup>b</sup> Burned down during season. Not opened the next year.

## PACK OF CANNED SALMON ON SMITH RIVER, CAL., IN SPECIFIED YEARS.

Years.	Can-neries operated.	Quinnat.		Silverside.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1878.....	1	4,277	\$23,096	-----	-----	4,277	\$23,096
1880.....	1	7,500	41,250	-----	-----	7,500	41,250
1884.....	1	5,500	33,000	-----	-----	5,500	33,000
1885.....	1	1,550	9,300	-----	-----	1,550	9,300
1888.....	1	2,347	14,082	-----	-----	2,347	14,082
1893.....	1	1,500	7,500	500	\$1,500	2,000	9,000
1894.....	1	1,500	7,500	500	1,500	2,000	9,000
1895.....	1	2,250	9,990	-----	-----	2,250	9,990
1914.....	1	-----	-----	3,000	18,000	3,000	18,000
1915.....	1	1,955	13,685	1,078	6,220	3,033	19,905

## PACK OF CANNED SALMON ON KLAMATH RIVER, CAL., IN SPECIFIED YEARS.

Years.	Can-neries operated.	Quinnat.		Silverside.		Total.	
		Cases.	Value.	Cases.	Value.	Cases.	Value.
1888.....	1	4,400	\$26,400	-----	-----	4,400	\$26,400
1892.....	1	1,047	4,188	-----	-----	1,047	4,188
1893.....	1	1,600	6,400	-----	-----	1,600	6,400
1894.....	1	1,700	6,800	-----	-----	1,700	6,800
1895.....	1	1,200	5,321	400	\$1,500	1,600	6,821
1899.....	1	1,600	8,800	-----	-----	1,600	8,800
1902.....	1	2,500	13,500	-----	-----	2,500	13,500
1904.....	1	3,400	20,800	-----	-----	3,400	20,800
1909.....	1	5,633	33,000	-----	-----	5,633	33,000
1910.....	1	8,016	52,000	-----	-----	8,016	52,000
1911.....	1	7,400	46,000	204	816	7,604	46,816
1912.....	2	18,000	117,000	-----	-----	18,000	117,000
1913.....	2	6,376	40,500	-----	-----	6,376	40,500
1914.....	1	7,500	48,500	3,500	14,000	11,000	62,500
1915.....	1	10,400	72,800	2,500	13,000	12,900	85,800

PACK OF CANNED SALMON ON EEL RIVER, CAL.,-IN SPECIFIED YEARS.<sup>a</sup>

Years.	Can-neries operated.	Quinnat.		Years.	Can-neries operated.	Quinnat.	
		Cases.	Value.			Cases.	Value.
1877.....	1	8,500	\$51,000	1885.....	1	5,750	-----
1878.....	1	10,500	56,700	1886.....	1	12,500	\$75,000
1880.....	1	6,250	-----	1910.....	1	6,000	42,000
1883.....	1	15,000	-----	1911.....	1	8,400	52,500
1884.....	1	8,200	-----	1912.....	1	11,000	71,500

<sup>a</sup> Shut down in 1913, 1914, and 1915.

## PACK OF CANNED SALMON ON THE SACRAMENTO RIVER IN SPECIFIED YEARS.

Years.	Can- neries operated.	Quinnat.		Years.	Can- neries operated.	Quinnat.	
		Cases.	Value.			Cases.	Value.
1864.....	1	2,000	.....	1891.....	.....	10,353	.....
1865.....	1	2,000	.....	1892.....	.....	2,281	.....
1874.....	.....	2,500	.....	1893.....	3	23,336	.....
1875.....	.....	3,000	.....	1894.....	2	28,463	.....
1876.....	2	10,000	.....	1895.....	3	25,185	\$111,821
1877.....	.....	21,500	.....	1896.....	.....	13,387	.....
1878.....	6	34,017	\$183,692	1897.....	.....	38,543	.....
1879.....	4	13,855	59,577	1898.....	.....	29,731	.....
1880.....	9	62,000	.....	1899.....	.....	32,580	150,688
1881.....	.....	181,200	.....	1900.....	.....	39,304	.....
1882.....	19	200,000	.....	1901.....	.....	17,500	.....
1883.....	21	123,000	.....	1902.....	.....	14,043	.....
1884.....	.....	81,450	.....	1903.....	.....	8,200	.....
1885.....	6	90,000	.....	1904.....	2	14,407	66,936
1886.....	9	39,300	.....	1905.....	1	2,780	.....
1887.....	.....	36,500	.....	1911.....	1	4,142	28,994
1888.....	6	68,075	423,750	1913.....	1	950	6,650
1889.....	3	57,300	.....	1914.....	2	17,315	95,232
1890.....	.....	25,065	.....	1915 <sup>a</sup> .....	2	6,179	42,753

<sup>a</sup> In 1915 a cannery at Monterey packed 950 cases of chinook salmon, valued at \$7,300, which has been included.

## PACK OF CANNED SALMON IN ALASKA, BY DISTRICTS, FROM THE INCEPTION OF THE INDUSTRY.

Years.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Can- neries operated.	Pack.	Can- neries operated.	Pack.	Can- neries operated.	Pack.	Can- neries operated.	Pack.
		<i>Cases.</i>		<i>Cases.</i>		<i>Cases.</i>		<i>Cases.</i>
1878.....	2	8,159	.....	.....	.....	.....	2	8,159
1879.....	2	12,530	.....	.....	.....	.....	2	12,530
1880.....	1	6,539	.....	.....	.....	.....	1	6,539
1881.....	1	8,977	.....	.....	.....	.....	1	8,977
1882.....	1	11,501	2	10,244	.....	.....	3	21,745
1883.....	4	20,040	2	28,297	.....	.....	6	48,337
1884.....	4	22,189	2	42,297	1	<sup>a</sup> 400	7	64,886
1885.....	3	16,728	2	52,687	1	14,000	6	83,415
1886.....	4	18,660	2	74,583	3	48,822	9	142,065
1887.....	5	31,462	2	102,515	3	72,700	10	206,677
1888.....	6	81,128	6	241,101	4	89,886	16	412,115
1889.....	12	141,760	21	461,451	4	115,985	37	719,196
1890.....	12	142,901	19	421,300	4	118,390	35	682,591
1891.....	11	156,615	14	511,367	5	133,418	30	801,400
1892.....	7	115,722	6	295,496	2	63,499	15	474,717
1893.....	8	136,053	11	399,815	3	107,786	22	643,654
1894.....	7	142,544	10	435,052	4	108,844	21	686,440
1895.....	7	148,476	10	327,919	6	150,135	23	626,530
1896.....	9	262,381	12	485,990	8	218,336	29	966,707
1897.....	9	271,867	13	382,899	7	254,312	29	909,078
1898.....	9	251,385	14	395,009	7	318,703	30	965,097
1899.....	9	310,219	14	356,095	9	411,832	32	1,078,146
1900.....	16	456,639	14	492,223	12	599,277	42	1,548,139
1901.....	21	735,449	13	562,142	21	719,213	55	2,016,804
1902.....	26	906,676	12	583,690	26	1,046,458	64	2,536,824
1903.....	21	642,305	12	417,175	27	1,186,730	60	2,246,210
1904.....	12	569,003	11	499,485	32	885,268	55	1,953,756
1905.....	13	433,607	9	371,755	25	1,089,154	47	1,894,516
1906.....	20	767,285	8	473,024	19	978,735	47	2,219,044
1907.....	22	887,503	8	522,836	18	759,534	48	2,169,873
1908.....	23	1,011,648	8	425,721	19	1,169,604	50	2,606,973
1909.....	19	852,870	8	391,054	18	1,151,553	45	2,395,477
1910.....	23	1,066,399	10	432,517	19	914,138	52	2,413,054
1911.....	32	1,580,868	11	499,743	21	743,206	64	2,823,817
1912.....	51	2,033,648	14	625,062	22	1,395,931	87	4,054,641
1913.....	42	1,782,898	14	447,249	23	1,509,038	79	3,739,185
1914.....	44	1,776,075	14	658,791	23	1,621,787	81	4,056,653
1915.....	46	2,540,111	17	632,734	24	1,316,171	87	4,489,016
Total.....	.....	20,360,820	.....	13,059,318	.....	19,312,845	.....	52,732,983

<sup>a</sup> Experimental pack.

## PACK OF CANNED SALMON IN ALASKA FROM 1898 TO 1915, BY SPECIES.

Years.	Coho, or silver.		Chum, or keta.		Humpback, or pink.	
	Cases.	Value.	Cases.	Value.	Cases.	Value.
1898.....	54,711	.....	5,184	.....	109,399	.....
1899.....	39,402	.....	1,931	.....	149,159	.....
1900.....	50,984	.....	30,012	.....	232,022	.....
1901.....	65,509	.....	47,464	.....	541,427	.....
1902.....	82,723	.....	159,849	.....	549,602	.....
1903.....	120,506	.....	35,052	.....	355,799	.....
1904.....	85,741	.....	21,178	.....	299,333	.....
1905.....	67,394	\$215,875	41,972	\$113,056	168,597	\$498,194
1906.....	109,141	382,109	254,812	730,235	348,297	1,046,951
1907.....	85,190	337,384	184,173	547,757	561,973	1,799,280
1908.....	68,827	274,089	218,513	554,197	644,132	1,733,379
1909.....	56,556	231,029	120,712	274,110	464,873	1,114,839
1910.....	114,026	559,666	254,218	773,409	554,322	1,764,055
1911.....	133,908	762,647	323,795	1,199,563	1,005,278	3,972,706
1912.....	166,198	741,377	664,633	1,584,130	1,280,138	3,296,598
1913.....	75,779	261,654	290,918	643,948	1,372,881	3,550,587
1914.....	157,063	690,086	663,859	2,240,765	986,049	3,459,116
1915.....	126,570	588,903	484,408	1,356,469	1,870,373	5,619,436

Years.	King, or spring.		Red, or sockeye.		Total.	
	Cases.	Value.	Cases.	Value.	Cases.	Value.
1898.....	12,862	.....	782,941	.....	965,097	.....
1899.....	23,400	.....	864,254	.....	1,078,146	.....
1900.....	37,715	.....	1,197,406	.....	1,548,139	.....
1901.....	43,069	.....	1,319,335	.....	2,016,804	.....
1902.....	59,104	.....	1,685,546	.....	2,536,824	.....
1903.....	47,609	.....	1,687,244	.....	2,246,210	.....
1904.....	41,956	.....	1,505,548	.....	1,953,756	.....
1905.....	42,125	\$141,999	1,574,428	\$5,335,547	1,894,516	\$6,304,671
1906.....	30,834	116,222	1,475,961	5,620,875	2,219,044	7,896,392
1907.....	43,424	181,718	1,295,113	5,915,227	2,169,873	8,781,366
1908.....	23,730	99,867	1,651,770	7,524,251	2,606,973	10,185,783
1909.....	48,034	207,624	1,705,302	7,610,550	2,395,477	9,438,152
1910.....	40,221	214,802	1,450,267	7,774,390	2,413,054	11,086,322
1911.....	45,518	295,088	1,315,318	8,363,233	2,823,817	14,593,237
1912.....	43,317	243,331	1,900,355	10,426,481	4,054,641	16,291,927
1913.....	34,370	139,053	1,965,237	8,936,362	3,739,185	13,531,604
1914.....	48,039	241,105	2,201,643	12,289,517	4,056,653	18,920,589
1915.....	85,694	458,000	1,921,971	11,907,202	4,489,016	19,930,010

## PACK OF CANNED SALMON IN BRITISH COLUMBIA SINCE THE INCEPTION OF THE INDUSTRY, BY WATERS.

Years.	Can- neries oper- ated.	Fraser River.	Skeena River.	Rivers Inlet.	Nass River.	Outlying districts.	Total.
		<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>
1876.....	2	7,247					7,247
1877.....	5	55,387	3,000				58,387
1878.....	8	81,446	8,500				89,946
1879.....	9	50,490	10,603				61,093
1880.....	9	42,155	19,694				61,849
1881.....	11	142,516	21,560			5,500	169,576
1882.....	16	199,204	24,522	5,635	6,500	4,600	240,461
1883.....	20	105,701	31,157	10,780	9,400	6,400	163,438
1884.....	14	34,037	53,786	20,383	8,500	7,000	123,706
1885.....	9	89,617	12,900			6,000	108,517
1886.....	16	99,177	37,587	15,000		1,200	152,964
1887.....	20	130,088	58,592	11,203		4,200	204,083
1888.....	21	76,616	70,106	20,000	12,318	5,000	184,040
1889.....	28	310,122	58,405	21,722	19,800	7,162	417,211
1890.....	33	244,352	91,645	33,500	24,700	17,060	411,257
1891.....	38	177,989	77,057	36,500	11,058	11,907	314,511
1892.....	36	98,491	90,750	14,955	26,100	18,425	248,721
1893.....	44	474,237	59,021	35,416	15,680	25,848	610,202
1894.....	42	363,566	61,005	40,161	20,000	7,500	492,232
1895.....	49	432,920	69,356	58,575	20,541	6,300	587,692
1896.....	56	375,344	97,863	107,473	14,649	22,453	617,782
1897.....	65	879,776	61,310	40,090	20,000	26,007	1,027,183
1898.....	67	264,225	80,102	105,362	20,000	22,862	492,551
1899.....	68	527,396	112,562	76,428	19,442	29,691	765,519
1900.....	69	331,371	135,424	74,196	20,200	45,349	606,540
1901.....	78	998,913	125,845	66,794	15,004	40,656	1,247,212
1902.....	69	327,197	155,936	70,298	23,212	50,518	627,161
1903.....	61	237,162	98,688	69,389	18,094	50,514	473,847
1904.....	51	128,903	154,869	94,292	29,587	57,243	465,894
1905.....	64	846,998	114,085	83,122	32,725	90,892	1,167,822
1906.....	59	226,744	162,420	122,878	32,534	84,854	629,460
1907.....	42	163,116	159,255	94,064	31,832	99,192	547,459
1908.....	50	89,184	209,177	75,090	46,908	145,944	566,303
1909.....	86	567,230	142,740	91,014	40,990	151,086	993,060
1910.....	53	223,148	222,035	129,398	39,720	147,900	762,201
1911.....	69	301,344	254,410	101,066	65,684	226,461	948,965
1912.....	60	173,921	254,258	71,162	137,697	359,538	996,576
1913.....	81	732,059	164,055	53,423	68,096	336,268	1,353,901
1914.....	56	328,390	237,634	109,052	94,890	341,073	1,111,039
1915.....	61	289,199	279,161	146,838	104,289	313,894	1,133,381
Total.....	.....	11,227,008	4,081,075	2,105,259	1,050,150	2,777,507	21,240,999

PACK, BY SPECIES AND DISTRICTS, OF CANNED SALMON IN BRITISH COLUMBIA FROM 1903 <sup>a</sup> TO 1915.

Districts and species.	1903	1904	1905	1906	1907	1908	1909
<b>Fraser River district:</b>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>
Chums.....		1,066					
Cohos.....	25,728	45,667	30,836	34,413	35,766	24,198	21,540
Pinks.....	4,504		3,304	15,543	63,530	415	1,987
Sockeyes.....	204,809	72,688	837,489	183,007	59,815	63,126	542,248
Springs, red.....	2,084	9,482	5,507	6,503	3,448	1,427	1,428
Springs, white.....				1,020	557	18	
<b>Total.....</b>	<b>237,125</b>	<b>128,903</b>	<b>877,136</b>	<b>240,486</b>	<b>163,116</b>	<b>89,184</b>	<b>567,203</b>
<b>Skeena River district:</b>							
Chums.....		35,329					
Cohos.....	9,648	5,515	7,247	16,897	15,247	10,085	12,249
Pinks.....	20,045		7,523	38,991	25,217	45,404	28,120
Sockeyes.....	50,968	93,404	84,717	86,394	108,413	139,846	87,901
Springs, red.....	18,008	20,621	14,598	20,138	10,378	13,374	11,727
Springs, white.....						468	742
<b>Total.....</b>	<b>98,669</b>	<b>154,869</b>	<b>114,085</b>	<b>162,420</b>	<b>159,255</b>	<b>209,177</b>	<b>140,739</b>
<b>Rivers Inlet district:</b>							
Chums.....		61					
Cohos.....	219	358		66	5,040	9,505	1,400
Pinks.....	180				700	479	
Sockeyes.....	68,119	93,862	82,771	122,631	87,874	64,652	89,027
Springs, red.....	872	11	351	181	450	454	587
<b>Total.....</b>	<b>69,390</b>	<b>94,292</b>	<b>83,122</b>	<b>122,878</b>	<b>94,064</b>	<b>75,090</b>	<b>91,014</b>
<b>Nass River district:</b>							
Chums.....		31					
Cohos.....	2,187	1,697	3,083	5,997	6,093	8,348	6,818
Pinks.....			1,840	3,450	5,957	6,612	3,589
Sockeyes.....	8,438	15,000	24,462	22,166	17,813	27,584	28,246
Springs, red.....	1,475	2,357	3,340	858	1,288	3,263	2,280
Springs, white.....							57
Steelheads.....				63	681	1,101	
<b>Total.....</b>	<b>12,100</b>	<b>19,085</b>	<b>32,725</b>	<b>32,534</b>	<b>31,832</b>	<b>46,908</b>	<b>40,990</b>
<b>Outlying districts:</b>							
Chums.....		1,155					
Cohos.....	14,136	13,114	3,292	11,759	25,754	29,781	19,911
Pinks.....	2,653		1,303	10,321	23,300	23,538	12,848
Sockeyes.....	36,383	48,272	51,234	45,481	40,159	59,815	93,019
Springs, red.....	3,218	6,204	4,563	3,581	7,595	6,915	2,196
Springs, white.....					2,382	2,245	
Steelheads.....					2	36	
<b>Total.....</b>	<b>56,390</b>	<b>68,745</b>	<b>60,392</b>	<b>71,142</b>	<b>99,192</b>	<b>122,330</b>	<b>127,974</b>
<b>TOTAL BY SPECIES.</b>							
Chums.....		37,642					
Cohos.....	51,918	66,351	44,458	69,132	87,900	81,917	61,918
Pinks.....	27,382		13,970	68,305	118,704	76,448	46,544
Sockeyes.....	368,717	323,226	1,080,673	459,679	314,074	355,023	840,441
Springs, red.....	25,657	38,675	28,359	31,261	23,159	25,433	18,218
Springs, white.....				1,083	2,939	2,731	799
Steelheads.....					683	1,137	
<b>Grand total.....</b>	<b>473,674</b>	<b>465,894</b>	<b>1,167,460</b>	<b>629,460</b>	<b>547,459</b>	<b>542,689</b>	<b>967,920</b>

<sup>a</sup> In 1901 in the Fraser River district 920,313 cases of sockeyes were packed, and in 1902 sockeyes were packed as follows: 293,477 cases in Fraser River district, 117,677 cases in Skeena River district, 68,819 cases in Rivers Inlet district, 20,953 cases in Nass River district, and 30,510 cases in outlying districts.

<sup>b</sup> Pinks and chums combined.

**PACK, BY SPECIES AND DISTRICTS, OF CANNED SALMON IN BRITISH COLUMBIA FROM  
1903 to 1915—Continued.**

Districts and species.	1910	1911	1912	1913	1914	1915
<b>Fraser River district:</b>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>
Chums.....	52,177	47,237	12,961	22,220	74,726	18,539
Cohos.....	27,855	39,740	28,574	11,648	38,639	34,114
Pinks.....	128	142,101	574	9,973	6,057	128,555
Sockeyes.....	133,045	58,487	108,784	684,596	185,483	89,040
Springs, red.....	1,018	7,023	14,655	3,573	9,485	15,388
Springs, white.....	8,925	6,751	8,373	49	14,000	3,532
Steelheads.....						31
<b>Total.....</b>	<b>223,148</b>	<b>301,344</b>	<b>173,921</b>	<b>732,059</b>	<b>328,390</b>	<b>289,199</b>
<b>Skeena River district:</b>						
Chums.....		70	504		8,329	5,769
Cohos.....	11,531	23,376	a 39,835	18,647	16,378	32,190
Pinks.....	13,473	81,956	97,588	66,045	71,021	107,578
Sockeyes.....	187,246	131,066	92,498	52,927	130,166	116,553
Springs, red.....	9,546	15,514	19,332	23,250	11,529	15,069
Springs, white.....	239	2,428	4,501	3,186	211	204
<b>Total.....</b>	<b>222,035</b>	<b>254,410</b>	<b>254,258</b>	<b>164,055</b>	<b>237,634</b>	<b>279,161</b>
<b>Rivers Inlet district:</b>						
Chums.....		288	3,845		5,023	5,387
Cohos.....	2,075	6,287	11,010	3,660	7,789	7,115
Pinks.....	19	5,411	8,809	2,097	5,784	2,964
Sockeyes.....	126,921	88,763	112,884	61,745	89,890	130,350
Springs, red.....	383	317	681	594	566	1,022
Springs, white.....			468			
<b>Total.....</b>	<b>129,398</b>	<b>101,066</b>	<b>137,697</b>	<b>68,096</b>	<b>109,052</b>	<b>146,838</b>
<b>Nass River district:</b>						
Chums.....	351	5,189	3,245	2,987	25,569	11,076
Cohos.....	6,285	7,842	12,468	3,172	9,276	15,171
Pinks.....	895	11,467	12,476	20,539	25,333	34,879
Sockeyes.....	30,810	37,327	36,037	23,574	31,327	39,349
Springs, red.....	1,228	3,434	5,710	2,999	2,660	3,053
Springs, white.....	11	325	1,226	152	725	648
Steelheads.....	140	100				113
<b>Total.....</b>	<b>39,720</b>	<b>65,684</b>	<b>71,162</b>	<b>53,423</b>	<b>94,890</b>	<b>104,289</b>
<b>Outlying districts:</b>						
Chums.....	5,834	39,167	37,770	52,758	70,827	41,229
Cohos.....	26,636	42,457	73,422	32,695	48,119	58,366
Pinks.....	20,098	64,312	128,296	94,233	112,145	93,376
Sockeyes.....	87,893	67,866	94,559	149,336	99,830	100,750
Springs, red.....	7,138	12,458	21,967	7,017	8,668	17,202
Springs, white.....	301	201	3,524	229	1,484	1,986
Steelheads.....						985
<b>Total.....</b>	<b>147,900</b>	<b>226,461</b>	<b>359,538</b>	<b>336,268</b>	<b>341,073</b>	<b>313,894</b>
<b>TOTAL BY SPECIES.</b>						
Chums.....	58,362	91,951	58,325	77,965	184,474	82,000
Cohos.....	74,382	119,702	165,102	69,822	120,201	146,956
Pinks.....	34,613	305,247	247,743	192,887	220,340	367,352
Sockeyes.....	565,915	383,509	444,762	972,178	536,696	476,042
Springs, red.....	19,313	38,751	62,345	37,433	32,908	51,734
Springs, white.....	9,476	9,705	18,092	3,616	16,420	6,870
Steelheads.....	140	100	207			2,927
<b>Grand total.....</b>	<b>762,201</b>	<b>948,965</b>	<b>996,576</b>	<b>1,353,901</b>	<b>1,111,039</b>	<b>1,133,381</b>

• Includes 207 cases of steelheads.



## PICKLING INDUSTRY.

The salmon-pickling industry was so overshadowed by its giant brother, the canning industry, that statistical data, except for Alaska, were found in extremely fragmentary shape, and only that portion is shown relating to Alaska from the time of annexation to 1915.

## PACK OF SALTED SALMON IN ALASKA, 1868 TO 1915.

Years.	Salmon.		Salmon bellies.		Dry-salted salmon.	
	Barrels.	Value.	Barrels.	Value.	Pounds.	Value.
1868.....	2,000	\$16,000				
1869.....	1,700	13,600				
1870.....	1,800	14,400				
1871.....	700	6,300				
1872.....	1,000	9,000				
1873.....	900	7,200				
1874.....	1,400	11,200				
1875.....	1,200	9,600				
1876.....	1,800	14,400				
1877.....	1,950	15,700				
1878.....	2,100	16,800				
1879.....	3,500	28,000				
1880.....	3,700	29,600				
1881.....	1,760	15,840	300	\$3,300		
1882.....	5,890	53,010				
1883.....	7,251	65,259				
1884.....	6,106	54,954				
1885.....	3,230	29,070				
1886.....	4,861	43,749				
1887.....	3,978	35,802				
1888.....	9,500	85,500				
1889.....	6,457	58,013				
1890.....	18,039	162,351				
1891.....	8,913	71,304				
1892.....	17,374	140,057				
1893.....	24,005	120,083	53	815		
1894.....	32,011	176,060				
1895.....	14,234	85,404				
1896.....	9,314	65,198				
1897.....	15,848	110,936	150	1,200		
1898.....	22,670	181,360	2,846	28,460		
1899.....	22,382	167,865	580	5,800		
1900.....	31,852	238,890	235	2,350		
1901.....	24,477	171,339	2,353	23,530	511,400	\$10,228
1902.....	30,384	212,688	652	3,816		
1903.....	27,921	223,368	328	2,952		
1904.....	13,674	89,209	3,667	32,973	300,000	5,500
1905.....	19,071	143,811	208	1,950	966,812	16,180
1906.....	17,283	126,194	1,360	11,355	7,280,234	115,643
1907.....	22,307	203,127	1,338	13,644	1,107,680	16,969
1908.....	31,472	266,713	2,965	37,422	107,580	1,505
1909.....	28,443	183,400	7,600	85,994	20,800	416
1910.....	12,779	111,634	1,970	25,358	71,600	1,038
1911.....	8,483	102,477	1,626	19,007	22,178	554
1912.....	34,602	305,928	1,337	15,561	33,285	1,340
1913.....	37,881	272,726	37	606		
1914.....	25,954	247,195	451	6,523	21,282	1,235
1915.....	12,058	157,457	408	5,467	12,200	810
1916.....			571	13,610		
Total.....	529,294	4,041,445	28,802	313,536	10,388,284	168,033

ALASKA PICKLED-SALMON PACK, 1906 TO 1915, BY SPECIES, QUANTITY,<sup>a</sup> AND VALUE.

Species.	1906		1907		1908		1909		1910	
	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.
Whole salmon:										
Coho.....	539	\$5,642	1,665	\$16,406	692	\$5,648	318	\$2,485	160	\$1,504
Chum.....	231	1,550	233	1,521	122	707	35	190	.....	.....
Humpback.....	2,446	13,852	4,248	29,374	2,346	17,935	1,557	9,405	330	1,998
King.....	1,007	8,058	964	10,684	660	6,813	441	3,798	352	3,399
Red.....	13,061	97,092	15,197	145,142	30,517	262,274	26,508	167,298	11,931	104,649
Total.....	17,284	126,194	22,307	203,127	34,337	293,377	28,859	183,176	12,773	111,550
Bellies:										
Coho.....	.....	.....	191	2,696	229	3,535	255	3,843	126	1,135
Chum.....	30	150	.....	.....	117	699	.....	.....	70	770
Humpback.....	1,173	13,188	1,800	21,080	2,447	28,140	738	7,438	616	6,135
King.....	22	185	84	1,002	48	720	35	175	6	128
Red.....	13	121	890	12,644	1,895	26,236	942	13,902	808	10,839
Total.....	1,238	13,644	2,965	37,422	4,736	59,330	1,970	25,358	1,626	19,007
Backs, etc.:										
Humpback.....	.....	.....	.....	.....	.....	.....	56	224	.....	.....
King.....	.....	.....	.....	.....	.....	.....	.....	.....	2	24
Red.....	.....	.....	.....	.....	.....	.....	.....	.....	4	60
Total.....	.....	.....	.....	.....	.....	.....	56	224	6	84
Grand total...	18,522	139,838	25,272	240,549	29,073	352,707	30,885	208,758	14,405	130,641

Species.	1911		1912		1913		1914		1915	
	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.
Whole salmon:										
Coho.....	223	\$2,149	1,165	\$9,565	1,006	\$6,452	365	\$2,767	1,763	\$19,393
Chum.....	133	666	93	652	100	778	53	293	325	2,925
Humpback.....	1,122	11,238	4,236	28,304	2,724	18,181	482	2,954	662	5,958
King.....	600	8,095	225	2,442	135	1,410	269	2,588	377	4,147
Red.....	6,239	79,578	28,883	264,965	33,916	245,905	24,785	238,593	8,931	125,034
Total.....	8,317	101,726	34,602	305,928	37,881	272,726	25,954	247,195	12,058	157,457
Bellies:										
Coho.....	38	489	.....	.....	54	946	67	982	.....	.....
Chum.....	7	77	.....	.....	67	941	18	180	.....	.....
Humpback.....	676	5,122	37	606	324	4,546	229	2,620	133	2,660
King.....	2	30	.....	.....	.....	.....	2	13	.....	.....
Red.....	614	9,843	.....	.....	6	90	92	1,672	438	10,950
Total.....	1,337	15,561	37	606	451	6,523	408	5,467	571	13,610
Backs, etc.:										
Humpback.....	150	600	.....	.....	.....	.....	.....	.....	.....	.....
King.....	1	15	.....	.....	.....	.....	.....	.....	.....	.....
Red.....	15	136	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	166	751	.....	.....	.....	.....	.....	.....	.....	.....
Grand total...	9,820	118,038	34,639	306,534	38,332	279,249	26,362	252,662	12,629	171,067

<sup>a</sup> Barrels hold 200 pounds of fish; when of a different size they have been reduced to conform to this weight.

## MILD-CURING INDUSTRY.

The beginning of this industry on the Pacific coast is of comparatively recent date, and the following table is complete, with the possible exception of a few tierces, which may not have been reported for the coastal rivers of Oregon:

NUMBER OF TIERCES OF MILD-CURED SALMON PACKED ON THE PACIFIC COAST FROM 1897 TO 1915.<sup>a</sup>

Years.	Alaska.	British Columbia.	Puget Sound, Wash.	Grays Harbor, Wash.	Willapa Harbor, Wash.	Columbia River (both sides).	Coastal rivers, Oreg.	Eel River, Cal.	Sacramento River, Cal.	Monterey Bay, Cal.	Total.
1897						400					400
1898	70					700					770
1899	130			375		1,250					1,755
1900						1,275			950		2,225
1901	67		600			3,000			3,100		6,767
1902	67		425			4,213	188		2,325	504	7,722
1903	8		824			6,725			3,600	354	11,511
1904	34		1,250			9,088		200	4,719	248	15,539
1905	189	1,175	3,000			9,805	415		2,979	310	17,873
1906	1,126	957				8,000	740	175	2,177	510	13,685
1907	1,657	1,993	2,060	20	100	6,070	740	140	4,102	582	17,464
1908	1,378	1,060				4,960			3,243	252	10,893
1909	2,292	1,560	2,109	75	29	5,540	560	80	5,111	911	18,267
1910	3,357	1,638	2,435	67		7,922	1,398		5,516	75	22,408
1911	3,164	1,965	2,745	100	30	8,185	1,247	110	2,011	160	19,717
1912	5,245	1,489	3,013	357	40	5,824	3,082	100	3,274		22,424
1913	7,443	3,150	3,923	250	50	5,746	2,381		4,789	550	28,282
1914	4,091	3,182	1,934			5,205	457		1,829	1,476	18,174
1915	2,966	1,119	2,235			4,078	333	3	1,630	942	13,306
Total.	33,284	19,288	26,553	1,244	249	97,986	11,541	808	51,355	6,874	249,182

<sup>a</sup> The net weight of fish in a tierce is about 800 pounds. King, chinook, or spring salmon were used almost exclusively. From most places the data are complete from the time of the inception of the industry, but from a few minor places the data are somewhat fragmentary.

## YUKON TERRITORY, CANADA.

Some salmon fishing is carried on in that section of the upper Yukon River which lies in Yukon Territory, Dominion of Canada. The species taken are principally king and chum, and these are sold mainly in a fresh condition. The following table shows the quantity taken and the value of same in certain years:

CATCH OF SALMON IN YUKON TERRITORY, CANADA, IN SPECIFIED YEARS.

Years.	Salmon.		Years.	Salmon.	
	Pounds.	Value.		Pounds.	Value.
1903	70,000	\$5,600	1912	224,100	\$22,410
1909	138,574	17,566	1913	182,000	18,200
1910	169,900	18,689	1914	188,600	18,860
1911	229,000	22,900	1915	157,000	15,700

## MARKET PRICES FOR CANNED SALMON.

The manner of fixing the selling price at which the canner is willing to dispose of his canned product varies slightly in certain regions. In May or June, when the spring-packing season has sufficiently advanced so that a line can be gotten on the probable pack of chinook, the highest priced of the pack, the Columbia River canners agree upon a price, this usually being high or low, as the pack is small or large.

Since the Alaska Packers Association was formed, through a combination of a number of canneries operating in the Territory of Alaska, it has packed annually in recent years about one-fourth of the salmon canned. It also owns several canneries on Puget Sound, thus being quite a factor in that region also.

In the early days of the association the custom grew up amongst the smaller packers of Alaska and Puget Sound of waiting until the association fixed the prices on its own pack, when the others would generally fall into line with the same prices for their packs. This custom is still in vogue. At no time has it ever been compulsory on the part of any packer to adopt the same prices as the association. In fact, it has sometimes been the case that, while the small packer publicly quoted the association's opening prices, yet in secret he was shading it by  $2\frac{1}{2}$  to 5 cents per dozen on certain grades. In recent years this has frequently been the case and the big packers, who adhered to the opening prices, have had to sit idly by and watch their small competitors underselling them and getting the bulk of the business until they had finally disposed of their goods, when, necessarily, they would have to drop out of the market until the next season.

Occasionally the other packers do not like a certain quotation of the association and make one more nearly in consonance with their own views. This happened in 1913, when the association quoted 60 cents for chums, while the Puget Sound canners quoted 55 cents for this grade, and in 1915 when the association quoted 65 cents for chums and the Puget Sound interests 70 cents for the same grade, thus showing clearly the independence of the smaller packers.

Owing to a peculiar feature of the salmon marketing business, more depends upon the opening prices than appears on the surface to the uninitiated.

Shortly after the first of the year buyers throughout the world begin to take stock of their salmon supplies and soon thereafter begin placing their "future" orders. These cover the quantity required of each grade, and when the buyer orders through a broker the orders are placed subject to a contract similar to the following:

The undersigned hereby authorizes ——— to book the number of cases of canned salmon specified below; said booking to be filed with packers for delivery from ———

(naming year) pack, subject to buyers' approval of opening prices when named; the option being granted buyers of confirming the total number of cases specified below; confirming a smaller quantity, or declining any confirmation.

— furthermore agrees that buyers shall have the option of increasing quantities listed below, when he names opening prices for his packers, contingent upon his ability to secure at that time an increased allotment from his packers. In event — secures an increased allotment from his packers insufficient to meet all increases requested by his patrons, he will distribute such increase as he can secure among the dealers who have filed conditional contracts with him, according to the date order that said contracts have been received in his office.

Under this form of contract the packer is expected to be ready to fulfill the terms of same, except in case of a short pack, when the orders are generally prorated, i. e., all orders are proportionately reduced until they come within the compass of the pack. Should the buyer dislike the opening price he has the privilege of canceling the order. While this latter privilege may not, at first glance, look just to the packer, yet it is doubtful if any buyer would place a "future" order unless he was assured of a chance to cancel his order should he feel that too high a sum was fixed in the opening prices.

Some canneries contract to sell their entire output to one buyer, and the price fixed is usually the opening prices for the year in question. In such cases the buyer and seller are both compelled to abide by the price, no matter how unjust one or the other may consider it.

The association does not announce its opening prices until late in August or early in September, when the greater part of the packing is over with and a good line on the total pack has been obtained, and it speaks well for the discernment of the officials of the association that their judgment as to prices should meet with the general approval as often as it does.

#### OPENING PRICES FOR A SERIES OF YEARS.

Below are shown the yearly opening prices on the various grades and sizes from 1890 to 1915. The most interesting part of this is the increase shown in the value of high-grade salmon. Columbia River chinook was quoted at \$1.05 for 1-pound talls in 1897, and it gradually advances until in 1915 it is quoted at \$1.90. Alaska red 1-pound talls in 1897 sold for 90 cents, the lowest during the period in question, advancing, with occasional recessions, until in 1911 it reached high-water mark of \$1.60. In 1915 the opening price was \$1.50. In 1897 Puget Sound 1-pound tall sockeye sold for 80 cents, 10 cents below Alaska red. In 1898 it sold for 20 cents less than reds. In 1902 it sold for \$1 as compared with 95 cents for Alaska red, and from that time on brought a higher price, being quoted at \$1.90 in 1915 as compared with \$1.50 for Alaska red.

Medium red or coho did not figure in the opening prices until 1908, when Puget Sound coho sold for 5 cents a dozen more than Alaska coho. Very shortly thereafter, however, both were classed together

and sold for the same price. This grade has not had the wide fluctuations of the others, due mainly to the generally small pack made annually.

Pink salmon has been the football of the salmon market ever since the pack became of sufficient size to become a feature in it. The size of the pack has been steadily increasing, as the fish became better known, and while the price obtained has been excellent in certain years (in 1911 it sold at \$1 per dozen, the highest point reached), usually the price has been low. In 1897 it was quoted at 65 cents. In 1915 the opening price was 75 cents, but as a matter of fact a large part of the pack really sold for 65 cents. The lowest point it reached was in 1903, when it was quoted at 50 cents a dozen.

It is only of recent years that chum salmon has become a factor in the market. Although sold for some time before then, chum salmon appears first in the regular opening prices in 1908, when they were quoted at 70 cents a dozen. In 1913 it was quoted at 55 cents, while the opening price in 1915 was 70 cents on Puget Sound and 65 cents at San Francisco.

The pack of Alaska and Puget Sound kings, or springs, has always been small, and while they have always been quoted at \$1 per dozen or better (in 1911 they were quoted at \$1.80) they have always been slow sellers. It is extremely improbable that the canned pack will increase much in the future, as this fish is the best for mild curing, and as the mild curers are able to offer better prices for the raw fish than the canneries, they will always get the fish when desired.

OPENING PRICES PER DOZEN CANS SINCE 1890.  
1890 TO 1902.

Years and species.	Talls.	Years and species.	Talls.	Years and species.	Talls.
1890.		1895.		1899.	
Columbia River chinook..	\$1.40	Columbia River chinook..	\$1.32½	Columbia River chinook..	\$1.25
Alaska red.....	1.20	Alaska red.....	1.15	Alaska red.....	1.10
Alaska pink.....	.75	Alaska pink.....	.80	Puget Sound sockeye.....	1.10
				Alaska pink.....	.67½
1891.		1896.		1900.	
Columbia River chinook..	1.35	Columbia River chinook..	1.25	Columbia River chinook..	1.60
Alaska red.....	1.20	Alaska red.....	1.10	Alaska red.....	1.25
Alaska pink.....	.75	Alaska pink.....	.75	Puget Sound sockeye.....	1.10
				Alaska pink.....	.75
1892.		1897.		1901.	
Columbia River chinook..	1.35	Columbia River chinook..	1.05	Columbia River chinook..	1.50
Alaska red.....	1.15	Alaska red.....	.95	Alaska red.....	1.25
Alaska pink.....	.75	Puget Sound sockeye.....	.80	Puget Sound sockeye.....	.95
		Alaska pink.....	.65	Alaska pink.....	.75
1893.		1898.		1902.	
Columbia River chinook..	1.32½	Columbia River chinook..	1.05	Columbia River chinook..	1.35
Alaska red.....	1.17½	Alaska red.....	.97½	Alaska red.....	1.00
Alaska pink.....	.65	Puget Sound sockeye.....	.80	Puget Sound sockeye.....	1.00
		Alaska pink.....	.65	Alaska pink.....	.65
1894.					
Columbia River chinook..	1.35				
Alaska red.....	1.10				
Alaska pink.....	.60				

## OPENING PRICES PER DOZEN CANS SINCE 1890—Continued.

1903 TO 1915.

Years and species.	Tails.	Flats.	Halves.	Years and species.	Tails.	Flats.	Halves.
1903.				1910.			
Puget Sound sockeye.....	\$1.50	\$1.60	\$0.90	Columbia River chinook, fancy.....	\$1.75	\$1.90	\$1.10
Columbia River chinook.....	1.35	1.45	.85	Puget Sound sockeye.....	1.65	1.80	1.10
Alaska red.....	1.30			Alaska red.....	1.35	1.50	1.00
Alaska pink.....	.50			Alaska king.....	1.35		
1904.				Alaska pink.....	.80		
Columbia River chinook.....	1.45	1.15	.90	Alaska chum.....	.77½		
Puget Sound sockeye.....	1.55	1.65	.95	Medium red and coho.....	1.25	1.40	.80
Alaska red.....	1.30			1911.			
Alaska pink.....	.70			Columbia River chinook, fancy.....	1.95	2.00	1.30
1905.				Puget Sound sockeye.....	1.95	2.00	1.30
Columbia River chinook.....	1.45	1.55	.90	Alaska red.....	1.60	1.75	1.12½
Puget Sound sockeye.....	1.35	1.50	4.00	Alaska medium red.....	1.45	1.65	1.00
Alaska red.....	1.00			Alaska king.....	1.80	2.00	1.12½
Alaska pink.....	.70			Pink.....	1.00	1.15	.80
1906.				Chum.....	.95	1.05	.75
Columbia River chinook.....	1.50	1.60	1.00	1912.			
Puget Sound sockeye.....	1.45	1.60	1.00	Chinook.....	1.95	2.00	1.25
Alaska red.....	.95			Sockeye.....	1.95	2.00	1.30
Alaska pink.....	.75			Alaska red.....	1.40	1.60	1.15
1907.				Alaska medium red.....	1.15	1.25	.80
Columbia River chinook.....	1.65	1.75	1.05	Alaska king.....	1.40	1.60	1.15
Puget Sound sockeye.....	1.60	1.75	1.10	Pink.....	.65	.65	.55
Alaska red.....	1.15			Chum.....	.62½		.50
Alaska pink.....	.80			1913.			
1908.				Chinook.....	1.95	2.00	1.25
Columbia River chinook.....	1.65	1.75	1.05	Sockeye.....	1.50	1.65	1.05
Puget Sound sockeye.....	1.60	1.75	1.05	Alaska red.....	1.15	1.35	.95
Puget Sound pink.....	.75	.80		Alaska medium red.....	.85	1.00	.70
Puget Sound coho.....	1.05	1.15	.75	Alaska king.....	1.00	1.15	.90
Alaska red.....	1.15			Pink.....	.65	.80	.55
Alaska king.....	1.05			Chum.....	a. 55	.70	.50
Alaska coho.....	1.00			1914.			
Alaska pink.....	.70			Chinook.....	1.95	2.10	1.25
Alaska chum.....	.70			Sockeye.....	1.95	2.15	1.35
1909.				Alaska red.....	1.45	1.80	1.10
Columbia River chinook, fancy.....	1.65	1.75	1.05	Medium red.....	1.15	1.35	.82½
Puget Sound sockeye.....	1.35	1.50	1.00	Alaska king.....	1.40		1.10
Alaska red.....	1.15	1.35	.85	Pink.....	.90	1.00	.70
Alaska king.....	1.10			Keta, or chum.....	.85	.95	.65
Alaska coho.....	1.05	1.20	.70	1915.			
Alaska pink.....	.60			Chinook.....	1.90	2.00	1.25
Alaska chum.....	.57½			Sockeye.....	1.95	2.15	1.35
				Alaska red.....	1.50	1.85	1.15
				Medium red.....	1.15	1.30	.75
				Alaska king.....	1.25		
				Pink.....	.75	.85	.57½
				Keta, or chum.....	0.70	.80	.52½

a The opening price in San Francisco was 60 cents.

b The opening price in San Francisco was 65 cents.

## XI. TRADE WITH OUTLYING POSSESSIONS.

As a result of the war with Spain the United States in 1898 acquired possession of Porto Rico, Guam, and the Philippine Islands, while in the same year Hawaii became a part of this country at its own request, and in 1900 two islands of the Samoan group were acquired by a partition agreement with Great Britain and Germany. The trade with the Philippine Islands is shown to date in the tables of exports and imports to foreign countries, but the trade with the other possessions has been eliminated from these tables and shown separately ever since their annexation to the United States.

### HAWAII.

The islands constituting this Territory, owing to their reciprocity treaty with this country for a number of years before annexation, purchased their supplies of salmon from the United States almost exclusively. In recent years the Territory has imported the following quantities of salmon from the mainland:

Years ending June 30—	Canned.		All other, fresh or cured.	Years ending June 30—	Canned.		All other, fresh or cured.
	Pounds.	Value.			Pounds.	Value.	
1907.....	1, 126, 217	\$89, 286	<i>Value.</i> \$64, 232	1912.....	1, 850, 567	\$194, 385	<i>Value.</i> \$57, 495
1908.....	965, 029	89, 025	67, 143	1913.....	1, 841, 874	173, 202	(a)
1909.....	1, 440, 410	121, 716	73, 848	1914.....	1, 418, 941	97, 532	(a)
1910.....	1, 381, 398	113, 526	72, 194	1915.....	1, 005, 848	90, 705	(a)
1911.....	1, 231, 264	119, 872	76, 572				

a Not shown separately.

### PORTO RICO.

Of recent years the following shipments of domestic salmon have been made to this island:

Years ending June 30—	Canned.		All other, fresh or cured.	Years ending June 30—	Canned.		All other, fresh or cured.
	Pounds.	Value.			Pounds.	Value.	
1907.....	604, 627	\$53, 916	<i>Value.</i> \$2, 893	1912.....	710, 721	\$65, 354	<i>Value.</i> \$1, 208
1908.....	512, 038	48, 195	1, 428	1913.....	666, 602	66, 811	(a)
1909.....	381, 171	34, 777	3, 810	1914.....	416, 414	41, 726	(a)
1910.....	511, 055	43, 494	6, 243	1915.....	588, 889	56, 527	(a)
1911.....	357, 382	30, 699	3, 868				

a Not shown separately.



## PHILIPPINE ISLANDS.

Of recent years the following shipments of domestic salmon have been made to these islands:

Years ending June 30—	Canned.		All other, fresh or cured.	Years ending June 30—	Canned.		All other, fresh or cured.
	Pounds.	Value.			Pounds.	Value.	
1909.....	1,126,470	\$74,792	Value. \$712	1913.....	10,122,820	\$590,128	Value. (a)
1910.....	5,425,404	396,604	2,089	1914.....	5,034,252	266,369	(a)
1911.....	3,069,118	225,885	3,542	1915.....	4,159,580	288,548	(a)
1912.....	5,096,810	422,001	2,437				

a Not shown separately.

## ALASKA.

It seems like "carrying coals to Newcastle" to ship canned salmon to Alaska, from which Territory more than half the canned salmon of the world is produced, and yet a small business is done each year in this line, most of the product going to the mining camps and towns somewhat removed from the fishing sections.

The following table shows the shipments of such fish in recent years:

Years ending June 30—	Canned.		All other, fresh or cured.	Years ending June 30—	Canned.		All other, fresh or cured.
	Pounds.	Value.			Pounds.	Value.	
1909.....	67,132	\$7,123	Value. \$3,966	1912.....	134,320	\$15,022	Value. \$4,218
1910.....	67,658	7,204	3,558	1913.....	43,346	5,074	(a)
1911.....	38,265	4,513	1,061	1914.....	42,945	5,278	(a)

a Not shown separately.

## GUAM.

Since annexation, this country and Japan have been competing for the trade of this island, which, in earlier years, Japan controlled quite largely. During the last two years shown in the statement, however, the United States has secured the advantage. The following table shows the extent of the trade, which is made up almost entirely of salted or pickled salmon, only 900 pounds of fresh salmon, valued at \$92, having been shipped by this country to Guam in 1908. Since 1909 all the fishery products imported have been lumped under one heading and it has been impossible to distinguish the salmon from the other species.

Years and countries.	Pickled salmon.		Years and countries.	Pickled salmon.	
	Pounds.	Value.		Pounds.	Value.
1905.			1908.		
United States.....	1,415	\$71	United States.....	7,406	\$623
Japan.....	16,526	1,221	Japan.....	6,130	465
1907.			1909.		
United States.....	13,604	1,086	United States.....	10,779	740
Japan.....	19,862	1,601	Japan.....	4,295	344

## TUTUILA, SAMOA.

The customs statistics lump the imports of fish under one general heading, thus making it impossible to show separately the imports of salmon.

## XII. FOREIGN TRADE IN SALMON.

As we do not consume all of the salmon produced by our fisheries, it is necessary to find a foreign market for the surplus each season, but, as canned salmon has become one of the staples of the world, there is not much difficulty in this respect, especially since our only competitors are Canada, Siberia, and Japan. The two last named have not yet become much of a factor in the canned-salmon market, though they will as their fishing operations are extended. There is more competition in the pickled, fresh, and frozen markets, several European and Asiatic countries being large producers of these goods, as is Canada also, for a considerable proportion of which she is compelled to find an outside market.

### EXPORTS OF CANNED SALMON.

From the beginning of the industry a considerable proportion of the salmon canned has been exported, especially of the higher grades. In Europe the chief customer is Great Britain, taking about nine-tenths of all sent to European ports. Great Britain does not, however, consume this quantity, for a considerable part of her importations are reexported. On the North American Continent and adjacent islands the best customers are Mexico, Panama, and the British West Indies, in the order named. In South America, Peru, Argentina, and British Guiana were the leading markets in 1910. In 1908 Chile imported 4,196,060 pounds; in 1909 the importations dropped to 97,993 pounds, but increased in 1910 to 1,556,629 pounds. In Asia, Hongkong and China import canned salmon, although neither buys great quantities. The islands of the Pacific and Indian Oceans are large consumers. British Australasia took 5,474,818 pounds, valued at \$551,312, in 1910, and other good customers were the British East Indies and British, French, and German Oceania. In Africa the British and Portuguese possessions are the largest importers.

The movements of these products are naturally often influenced favorably or adversely as the tariffs of the various countries in which they are marketed are raised or lowered.

Some countries maintain excessively high tariffs, among these being Brazil, 30 cents per pound; Colombia, 8½ cents; Mexico, 4 cents; Guatemala, 6½ cents; Paraguay, 7 cents; Uruguay, 6 cents; Austria-Hungary, 8 cents, and Germany, 7 cents. Norway levies 6 cents a pound duty, but this is undoubtedly to protect her own salmon industry.

In but few of the tariff acts is canned salmon distinguished by name, being usually classed as "preserved fish," and as these are usually luxuries in many countries they bear an extra high duty as a result.

In addition to these high duties in some countries, especially in South America, there are various other charges, fees, etc., which

materially enhance the value of the goods before they reach the consumer. C. H. Clarke, of the salmon brokerage firm of Kelley-Clarke Co., of Seattle, Wash., prepared and published a statement <sup>a</sup> showing the comparative charges on 100 cases each of red Alaska and pink canned salmon from the time they leave Seattle up to the time they reach the hands of wholesalers in South America. This shows that the f. o. b. Seattle value of the red salmon was \$500 and of the pink salmon \$280. By the time these goods reached the hands of the Rio de Janeiro wholesalers the red salmon were worth \$1,900.07, while the pink salmon were worth \$1,677.87. At Montevideo, Uruguay, the red salmon were worth \$1,436.01 and the pink salmon \$1,213.81. The table is so interesting and instructive that it is reproduced entire herewith.

COMPARATIVE TABLE OF CHARGES ON 100 CASES EACH OF RED ALASKA AND PINK CANNED SALMON UP TO THE TIME THEY REACH HANDS OF WHOLESALEERS IN SOUTH AMERICA.

	Argentina (Buenos Aires).		Brazil (Rio de Janeiro).		Chile (Valparaiso).		Ecuador (Guayaquil).	
	Red.	Pink.	Red.	Pink.	Red.	Pink.	Red.	Pink.
F. o. b. Seattle value.....	\$500.00	\$280.00	\$500.00	\$280.00	\$500.00	\$280.00	\$500.00	\$280.00
Strapping.....	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Freight.....	104.75	104.75	114.50	114.50	45.00	45.00	45.00	45.00
Marine insurance, 5 per cent f. p. a.....	6.10	3.90	6.20	4.00	5.50	3.25	5.50	3.25
C. i. f. value.....	615.85	393.65	625.70	403.50	550.50	328.25	550.50	328.25
Consular fees in United States..	2.00	2.00	3.25	3.25	5.25	4.25	22.35	14.00
Customs duty.....	519.56	519.56	1,138.78	1,138.78	160.46	160.46	345.37	234.37
Analysis.....	2.12	2.12	6.47	6.47	.....	.....	.....	.....
Storage in customhouse.....	2.41	2.41	33.90	33.90	5.35	5.35	.....	.....
Handling in customhouse.....	7.24	7.24	.....	.....	2.51	2.51	.....	.....
Stamps and entry blanks.....	1.49	1.49	.....	.....	1.43	1.43	.....	.....
Statistics.....	.....	.....	10	10	.....	.....	.....	.....
Internal-revenue tax.....	.....	.....	7.77	7.77	.....	.....	.....	.....
Port tax.....	.....	.....	57.20	57.20	.....	.....	.....	.....
Customs brokerage.....	12.74	12.74	.....	.....	7.15	7.15	.....	.....
Wharfage, lighterage, cartage.....	7.64	7.64	26.90	26.90	3.65	3.65	19.30	19.30
Value ex customhouse.....	1,171.05	948.85	1,900.07	1,677.87	736.30	513.05	937.52	706.92

	Paraguay (Asuncion).		Peru (Callao).		Uruguay (Montevideo).		Venezuela (La Guayra).	
	Red.	Pink.	Red.	Pink.	Red.	Pink.	Red.	Pink.
F. o. b. Seattle value.....	\$500.00	\$280.00	\$500.00	\$280.00	\$500.00	\$280.00	\$500.00	\$280.00
Strapping.....	5.00	5.00	.....	.....	5.00	5.00	5.00	5.00
Freight.....	134.75	134.75	37.50	37.50	104.75	104.75	54.60	54.60
Marine insurance, 5 per cent f. p. a.....	9.60	6.30	5.40	3.20	6.10	3.90	5.60	3.40
C. i. f. value.....	649.35	426.05	542.90	320.70	615.85	393.65	565.20	343.00
Consular fees in United States..	2.00	2.00	5.75	3.45	1.05	1.05	12.85	12.85
Customs duty.....	308.25	308.25	275.86	275.86	779.30	779.30	238.96	238.06
Analysis.....	.....	.....	.....	.....	.....	.....	.....	.....
Storage in customhouse.....	.....	.....	.....	.....	16.15	16.15	.....	.....
Handling in customhouse.....	.....	.....	.....	.....	1.55	1.55	1.35	.97
Stamps and entry blanks.....	.....	.....	.58	.58	.....	.....	.....	.....
Statistics.....	.37	.37	.....	.....	.....	.....	.....	.....
Internal-revenue tax.....	.....	.....	.....	.....	.....	.....	.....	.....
Port tax.....	.....	.....	.....	.....	.....	.....	.....	.....
Customs brokerage.....	.....	.....	4.86	4.86	15.50	15.50	5.00	2.80
Wharfage, lighterage, cartage.....	6.33	6.33	15.69	15.69	6.61	6.61	12.82	12.82
Value ex customhouse.....	966.30	743.00	845.64	621.14	1,436.01	1,213.81	836.18	611.40

<sup>a</sup> Pacific Fisherman, vol. 13, no. 5, p. 11, 1915.

The following table shows the fiscal year exports of domestic canned salmon and the countries to which exported for the period from 1900 to 1915, inclusive:

## EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915.

Countries.	1900		1901		1902	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Europe:						
Austria-Hungary.....	2,208	\$309			250	\$25
Azores, and Madeira Islands.....	48	7	950	\$92		
Belgium.....	31,118	3,186	5,800	600	336	39
Denmark.....	24,492	2,455	3,168	326	860	92
France.....	22,544	2,130	61,790	6,565	23,956	1,889
Germany.....	16,110	1,431	77,921	7,567	10,905	1,068
Italy.....	120	10	2,496	244		
Malta, Gozo, etc.....			141	21		
Netherlands.....	3,048	299	288	30	4,800	400
Portugal.....	19,776	1,779			336	35
Russia, on Baltic and White Seas.....					8,400	932
Spain.....			1,536	151	675	67
Sweden and Norway.....	1,168	112	720	70	72	8
Switzerland.....	24	3				
United Kingdom.....	18,820,453	1,870,004	\$1,722,863	3,219,196	30,632,961	2,620,729
North America:						
Dominion of Canada—						
Nova Scotia, New Brunswick, etc.....					10	1
Quebec, Ontario, Manitoba, etc.....	24,137	2,514	101	10	22,442	2,493
British Columbia.....	382,811	33,454	1,725,251	223,230	1,866,272	159,682
Newfoundland and Labrador.....					810	73
Miquelon, Langley, etc.....	240	20				
Mexico.....	162,785	14,806	160,425	14,967	387,905	31,041
Central American States—						
British Honduras.....	16,488	1,604	19,331	2,054	23,467	2,370
Costa Rica.....	70,458	6,114	69,135	6,768	70,036	5,954
Guatemala.....	2,666	277	11,361	1,151	15,325	1,324
Honduras.....	7,193	677	7,681	776	4,924	498
Nicaragua.....	26,647	2,684	21,543	2,256	17,125	1,635
Salvador.....	550	60	550	55	1,828	161
Bermuda.....	59,672	6,158	63,786	7,398	76,456	7,768
West Indies—						
British.....	259,249	25,651	315,209	33,635	242,999	24,191
Danish.....	9,085	873	8,612	929	14,526	1,390
Dutch.....	13,303	1,610	16,591	1,944	13,112	1,506
French.....	432	45	1,084	127	960	96
Haiti.....	468	44	595	65	920	88
Dominican Republic.....	2,764	297	1,899	192	1,531	140
Cuba.....	8,406	786	20,407	1,883	20,196	1,618
Porto Rico.....	4,394	390				
South America:						
Argentina.....	104,367	8,822	127,751	10,916	88,622	7,816
Bolivia.....			240	37	15,110	1,147
Brazil.....	637,638	76,152	207,033	23,506	87,800	8,350
Chile.....	647,328	61,800	645,323	64,059	384,766	28,529
Colombia.....	92,568	9,075	97,163	9,975	86,046	7,451
Ecuador.....	50,387	5,631	98,587	10,387	24,937	1,868
Guiana—						
British.....	168,718	16,197	136,192	14,807	146,502	14,604
Dutch.....	43,096	3,553	61,334	6,542	92,971	8,718
French.....	3,240	299	2,248	261	8,316	850
Peru.....	75,621	7,392	124,823	12,526	313,476	24,444
Uruguay.....	2,837	285	9,408	933	1,016	104
Venezuela.....	42,125	3,712	66,911	6,913	42,436	4,026
Asia and Oceania:						
Aden.....	216	22				
Chinese Empire.....	40,960	4,255	149,295	15,263	117,043	8,716
China—Russian.....			20,644	2,058	9,460	772
Hongkong.....	63,210	6,488	78,960	8,056	551,860	40,261
Japan.....	11,560	1,200	285,036	28,990	14,578	1,220
Korea.....			1,105	115	2,208	179
Russia, Asiatic.....			1,495	145	6,572	521
Turkey in Asia.....			144	16		
East Indies—						
British.....	538,180	55,976	312,805	31,528	733,685	56,912
Dutch.....			3,960	400	161,940	12,093

## EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1900		1901		1902	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Asia and Oceania—Cont'd.						
British Australasia.....	2,804,004	\$283,110	3,442,085	\$343,540	7,131,641	\$599,671
British Oceania.....					151,998	10,555
French Oceania.....	103,940	10,732	118,355	12,026	142,570	11,355
German Oceania.....			8,480	874	12,900	997
Guam <sup>a</sup> .....	480	50				
Hawaii <sup>b</sup> .....	860,682	84,808				
Philippine Islands.....	1,160	120	39,316	3,925	718,876	46,712
Tonga, Samoa, and all other.....	112,380	11,646	73,040	7,168		
Tutuila <sup>c</sup> .....					21,176	1,451
Africa:						
British Africa.....	632,012	57,387	816,433	79,063	2,581,088	219,233
Canary Islands.....			656	66		
French Africa.....	4,320	421	4,080	415	200	21
Liberia.....	312	30				
Portuguese Africa.....	47,812	4,696	35,384	3,459	52,726	4,931
All other Africa.....					6,200	582
Total.....	27,082,370	2,693,648	41,289,500	4,230,271	47,173,114	3,991,402
RECAPITULATION.						
Europe.....	18,941,109	1,881,725	31,877,663	3,234,862	30,683,551	2,625,284
North America.....	1,051,808	98,064	2,443,561	297,440	2,780,844	242,029
South America.....	1,868,225	192,918	1,577,013	160,862	1,291,998	107,907
Asia.....	654,126	67,941	853,434	86,571	1,597,346	120,674
Oceania.....	3,882,646	390,466	3,681,276	367,533	8,179,161	670,741
Africa.....	684,456	62,534	856,553	83,003	2,640,214	224,767

Countries.	1903		1904		1905	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Europe:						
Austria-Hungary.....	400	\$25	384	\$36		
Azores, and Madeira Islands.....			48	5	384	\$41
Belgium.....	788	73	480	53	9,760	1,019
Denmark.....	80	8	100	8		
France.....	2,400	260	4,800	600	21,995	2,262
Germany.....	32,268	2,470	18,790	1,747	1,210	122
Italy.....	1,120	114	5,232	556	5,760	465
Netherlands.....	1,072	124	4,072	414	3,250	349
Norway <sup>d</sup> .....	96	10	1,440	150		
Spain.....	3,108	316	1,400	140	2,700	249
Sweden <sup>d</sup> .....			70	7	96	10
Switzerland.....	240	24				
United Kingdom.....	35,369,196	3,121,774	33,555,080	3,505,102	21,026,108	1,872,992
North America:						
Dominion of Canada:					290,850	21,121
Nova Scotia, New Brunswick, etc.....			49	4		
Quebec, Ontario, Manitoba, etc.....	43,107	5,171	153,697	9,558		
British Columbia.....	3,246,082	287,212	1,086,370	95,021		
Newfoundland and Labrador.....					240	25
Mexico.....	356,951	26,787	538,949	38,691	493,371	40,597
Central American States—						
British Honduras.....	24,187	2,316	28,044	2,534	28,959	2,534
Costa Rica.....	36,806	3,072	58,828	4,668	93,580	8,179
Guatemala.....	3,527	295	15,732	1,131	20,498	1,583
Honduras.....	7,455	716	12,428	1,090	14,434	1,221
Nicaragua.....	20,089	1,771	28,159	2,394	42,103	3,146
Panama <sup>e</sup> .....			18,466	1,671	112,320	9,211
Salvador.....	3,360	252	4,304	326	2,296	184
Bermuda.....	64,264	6,792	36,022	3,778	33,821	3,634

<sup>a</sup> Guam was annexed to the United States in 1898.<sup>b</sup> Hawaii was annexed to the United States in 1898.<sup>c</sup> Tutuila was acquired in 1898.<sup>d</sup> Sweden and Norway separated in 1905.<sup>e</sup> Panama separated from Colombia in 1903.

## EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1903		1904		1905	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
North America—Continued.						
West Indies—						
British.....	418,636	\$38,434	409,219	\$37,389	366,747	\$34,262
Danish.....	9,647	903	7,442	752	9,474	965
Dutch.....	22,981	2,480	17,878	1,999	13,051	1,419
French.....	892	92	984	86	660	64
Haiti.....	2,496	238	2,115	228	1,611	164
Dominican Republic.....	3,290	335	7,660	719	4,855	452
Cuba.....	21,636	1,789	24,677	2,324	36,903	3,373
South America:						
Argentina.....	72,445	6,808	66,275	6,612	120,586	11,263
Bolivia.....	384	40	672	80	170	17
Brazil.....	88,740	8,481	114,033	11,742	188,342	17,908
Chile.....	1,044,490	59,354	1,218,266	72,205	821,171	56,160
Colombia.....	149,272	11,194	118,269	10,104	81,239	7,491
Ecuador.....	45,126	3,115	59,266	4,041	121,894	7,941
Guiana—						
British.....	172,300	16,829	112,360	11,226	135,424	13,617
Dutch.....	52,138	4,959	78,464	8,280	45,231	4,797
French.....	18,752	1,805	11,169	1,307	11,684	1,228
Peru.....	89,440	7,309	214,982	15,530	151,832	11,369
Uruguay.....	2,140	185	2,246	225	3,250	325
Venezuela.....	20,987	1,839	59,857	5,981	28,005	2,825
Asia and Oceania:						
Aden.....					2,520	180
Chinese Empire.....	166,522	13,602	218,142	18,770	249,386	17,587
China—Russian.....	53,368	5,111	40,000	3,932		
Hongkong.....	814,008	56,225	160,367	11,870	518,423	36,635
Japan.....	13,536	1,015	11,817,343	841,461	2,437,484	162,524
Korea.....	2,152	179	3,888	292	2,572	186
Russia, Asiatic.....	48	4	482	41		
Siam.....					384	31
East Indies—						
British.....	473,740	39,367	636,320	44,669	673,897	55,599
French.....					720	69
Dutch.....	235,680	19,256	119,216	9,018	109,476	7,893
All other Asia.....	240	24	10	1		
British Australasia.....	4,268,652	360,720	3,138,728	290,307	4,075,094	389,518
British Oceania.....	36,018	2,290	28,670	1,941	42,624	3,645
French Oceania.....	153,696	12,179	188,848	15,305	133,204	11,414
German Oceania.....	451,824	26,614	340,464	19,326	324,888	20,651
Philippine Islands.....	601,324	42,702	206,896	14,970	681,636	42,700
Africa:						
British Africa.....	1,454,226	127,921	794,758	77,911	1,259,269	121,120
Canary Islands.....	144	15			900	90
French Africa.....	2,220	207	3,200	320	4,800	460
Liberia.....	384	41	140	14	140	14
Portuguese Africa.....	167,964	17,043	137,640	13,906	200,826	20,365
Turkey in Africa—Egypt.....			388	30	2,448	204
All other Africa.....	5,200	506				
Total.....	50,353,334	4,350,791	55,924,278	5,224,598	35,066,555	3,035,469
RECAPITULATION.						
Europe.....	35,410,768	3,125,197	33,591,896	3,508,818	21,071,263	1,877,509
North America.....	4,285,406	378,655	2,446,023	204,363	1,565,773	132,134
South America.....	1,756,214	121,918	2,055,859	147,333	1,708,828	134,941
Asia.....	1,759,294	134,783	12,995,788	930,054	3,994,862	280,704
Oceania.....	5,511,514	444,505	3,898,606	341,849	5,257,446	467,928
Africa.....	1,630,138	145,733	936,126	92,181	1,468,383	142,253

Countries.	1906		1907		1908	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Europe:						
Austria-Hungary.....	1,260	\$135	1,220	\$112		
Azores, and Madeira Islands.....			883	89		
Belgium.....	500	60				
Denmark.....	40,200	4,112				
France.....	29,980	3,000			10,575	\$961
Germany.....	4,896	420	9,150	976	45,977	4,572
Italy.....	4,920	413	10,230	861		
Malta, Gozo, etc.....	420	36				

## EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 to 1915—Continued.

Countries.	1906		1907		1908	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
<b>Europe—Continued.</b>						
Netherlands.....	8,280	\$959	11,098	\$850		
Norway.....	40,200	3,981			17,670	\$1,860
Portugal.....					7,577	731
Spain.....	1,930	193	3,208	303	27,900	2,735
Sweden.....	10,000	1,050			10,500	1,000
United Kingdom.....	31,918,816	2,739,284	7,720,991	788,245	13,200,887	1,193,516
<b>North America:</b>						
Dominion of Canada.....	236,664	14,814	793,247	65,356	7,320	587
Mexico.....	699,002	56,747	877,989	73,582	1,068,824	94,278
<b>Central American States—</b>						
British Honduras.....	43,155	3,639	36,020	3,214	32,632	3,080
Costa Rica.....	106,879	8,968	148,157	12,260	138,421	12,260
Guatemala.....	26,925	1,989	31,242	2,535	29,777	2,319
Honduras.....	15,148	1,319	23,508	2,048	33,955	3,202
Nicaragua.....	39,949	3,022	41,106	3,335	27,721	2,302
Panama.....	308,624	25,965	443,687	38,642	487,079	46,883
Salvador.....	2,880	197	4,092	331	5,854	467
Bermuda.....	24,679	2,406	29,139	2,711	25,183	2,579
<b>West Indies—</b>						
British.....	471,814	43,368	515,664	46,510	687,620	64,275
Danish.....	9,713	1,011	13,336	1,340	15,604	1,658
Dutch.....	11,643	1,230	24,275	2,428	21,368	2,234
French.....	200	20	9	9	96	11
Haiti.....	2,953	291	914	91	864	85
Dominican Republic.....	11,688	1,137	9,278	891	13,887	1,371
Cuba.....	57,441	5,823	60,904	5,855	57,970	5,288
<b>South America:</b>						
Argentina.....	200,206	20,339	262,667	25,801	394,306	30,759
Bolivia.....	1,720	181	18,951	1,577	11,762	1,217
Brazil.....	188,278	18,975	150,952	14,880	146,826	14,055
Chile.....	4,462,147	154,396	4,168,876	286,229	4,196,060	296,194
Colombia.....	51,987	4,667	41,964	3,830	51,786	4,880
Ecuador.....	80,876	5,855	203,930	15,599	174,920	12,486
<b>Guiana—</b>						
British.....	120,016	12,391	116,120	12,202	140,514	16,014
Dutch.....	65,654	6,246	66,530	6,494	59,390	6,053
French.....	12,650	1,305	17,950	1,829	23,218	2,599
Peru.....	269,858	20,342	551,160	40,431	316,701	22,229
Uruguay.....	10,436	1,075	16,124	1,546	17,934	1,693
Venezuela.....	35,775	3,280	44,826	4,336	37,583	3,564
<b>Asia and Oceania:</b>						
Aden.....	480	50				
Chinese Empire.....	32,189	2,321	59,110	4,386	23,126	2,154
Hongkong.....	105,581	7,652	122,482	9,959	144,624	13,367
Japan.....	9,051	713	22,881	1,775	2,472	269
Korea.....	1,632	128	1,600	129	1,156	126
Russia, Asiatic.....	1,440	102	770	84	582	65
Siam.....			1,440	90	3,264	282
Turkey in Asia.....	750	90			290	30
<b>East Indies—</b>						
British.....	477,234	38,263	1,043,618	75,001	702,169	59,254
French.....	16,262	1,162			720	75
Dutch.....	134,796	9,692	167,590	13,940	126,168	11,286
British Australasia.....	5,230,076	426,814	5,451,378	462,648	3,654,756	330,029
British Oceania.....	11,952	923	40,080	2,958	14,660	1,278
French Oceania.....	125,998	10,274	137,472	11,494	185,608	15,732
German Oceania.....	214,920	14,503	156,939	11,267	105,696	8,345
Philippine Islands.....	757,400	56,743	933,288	63,838	1,171,834	84,533
<b>Africa:</b>						
British Africa.....	1,029,787	87,881	504,848	47,748	454,892	43,883
Canary Islands.....	782	76	144	17		
French Africa.....	144	14			48	6
German Africa.....			600	60		
Liberia.....					5,079	482
Portuguese Africa.....	161,178	16,001	104,837	10,307	83,640	8,325
Turkey in Africa—Egypt.....	2,400	200				
<b>Total.....</b>	<b>45,944,414</b>	<b>3,847,943</b>	<b>25,218,105</b>	<b>2,183,049</b>	<b>28,226,045</b>	<b>2,438,518</b>
<b>RECAPITULATION.</b>						
Europe.....	32,061,402	2,753,643	7,756,780	791,436	13,321,086	1,205,375
North America.....	2,069,357	171,946	3,052,658	261,138	2,654,175	242,879
South America.....	3,499,603	249,052	5,659,690	414,774	5,571,000	410,743
Asia.....	779,415	60,173	1,419,391	105,364	1,004,571	86,908
Oceania.....	6,340,346	509,257	6,719,157	552,205	5,131,554	439,917
Africa.....	1,194,291	103,872	610,429	58,132	543,659	52,696



## EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1909		1910	
	Pounds.	Value.	Pounds.	Value.
Europe:				
Azores and Madeira Islands.....			100	\$12
Denmark.....	192	\$18		
France.....			1,878	223
Germany.....	17,096	1,757	424	51
Italy.....	5,148	500		
Netherlands.....	11,612	1,017	9,744	1,020
Russia on Baltic and White Seas.....	2,050	205	11,580	1,210
Spain.....	3,160	311	5,100	506
Sweden.....	20,000	1,940		
United Kingdom.....	22,969,218	2,201,446	44,737,072	4,709,160
North America:				
Dominion of Canada.....	229,934	21,773	99,022	7,570
Mexico.....	756,052	58,124	697,217	50,782
Central American States—				
British Honduras.....	35,195	3,261	28,310	2,606
Costa Rica.....	118,266	9,828	157,946	12,237
Guatemala.....	13,957	1,117	16,821	1,361
Honduras.....	14,112	1,179	16,240	1,361
Nicaragua.....	21,534	1,656	28,116	2,066
Panama.....	528,228	50,940	482,717	45,404
Salvador.....	9,184	754	5,498	423
Bermuda.....	23,774	2,461	26,484	2,383
West Indies—				
British.....	358,114	36,644	548,561	53,939
Danish.....	14,848	1,568	14,655	1,512
Dutch.....	16,621	1,883	9,838	1,160
French.....	564	69	196	18
Haiti.....	2,184	203	2,038	185
Dominican Republic.....	13,258	1,306	22,120	2,058
Cuba.....	53,580	5,277	68,737	6,486
South America:				
Argentina.....	259,192	17,030	229,461	15,690
Bolivia.....	6,184	647	33,502	2,941
Brazil.....	176,150	17,109	267,354	28,241
Chile.....	97,993	6,918	1,556,629	92,259
Colombia.....	58,518	5,767	114,274	9,494
Ecuador.....	139,868	10,952	272,411	16,487
Guiana—				
British.....	255,039	25,981	222,398	22,133
Dutch.....	100,259	9,906	57,509	6,297
French.....	22,816	2,164	17,724	1,784
Peru.....	295,885	22,640	367,676	24,817
Uruguay.....	15,140	1,330	11,730	1,167
Venezuela.....	34,618	3,058	43,144	4,887
Asia and Oceania:				
Chinese Empire.....	53,448	4,887	28,522	2,688
China—British leased territory.....			3,120	345
Hongkong.....	103,448	9,707	121,558	12,234
Japan.....	15,078	1,245	3,716	352
Korea.....	2,652	266	2,016	220
Russia, Asiatic.....	5,380	394		
Siam.....	14,880	1,025	1,008	93
East Indies—				
British.....	989,592	85,094	1,246,751	101,619
French.....	528	56		
Dutch.....	201,696	16,908	189,604	15,920
All other Asia.....			480	45
British Australasia.....	5,704,960	590,094	5,474,818	551,312
British Oceania.....	109,936	7,437	66,826	5,160
French Oceania.....	162,336	14,570	241,200	22,589
German Oceania.....	279,792	18,311	360,576	22,554
Philippine Islands.....	1,126,470	74,792	5,425,404	396,604
Africa:				
British Africa.....	484,196	48,220	357,051	37,707
Canary Islands.....	510	51		
German Africa.....	350	36	910	92
Portuguese Africa.....	162,314	14,604	151,470	14,674
Turkey in Africa—Egypt.....			1,440	120
Total.....	36,117,109	3,416,436	63,860,696	6,314,258
RECAPITULATION.				
Europe.....	23,022,476	2,207,194	44,765,898	4,712,182
North America.....	2,209,405	198,043	2,224,516	191,551
South America.....	1,461,662	123,502	3,193,812	226,197
Asia.....	1,386,702	119,582	1,596,775	133,516
Oceania.....	7,383,494	705,204	11,568,824	998,219
Africa.....	647,370	62,911	510,871	52,593

## EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1911		1912		1913	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
<b>Europe:</b>						
Belgium.....			48,000	\$4,000	13,000	\$940
Denmark.....			134,871	13,484	186,996	17,485
Finland.....	12,000	\$1,170			2,400	250
France.....			480	58	33,120	2,710
Germany.....	1,340	163	193,341	16,160	41,929	3,688
Gibraltar.....					2,400	250
Italy.....					720	75
Malta, Gozo, etc.....					9,600	732
Netherlands.....			240	35	9,456	1,005
Norway.....					250	26
Portugal.....			400	46		
Russia in Europe.....			1,700	175		
Spain.....	10,000	802	2,085	216	1,300	134
Sweden.....			96	10		
United Kingdom—						
England.....	22,110,988	2,406,573	10,148,107	2,148,328	25,076,343	2,674,626
Scotland.....			16,400	1,470	30,640	3,333
<b>North America:</b>						
Bermuda.....	19,348	2,242	32,648	3,549	58,392	5,633
British Honduras.....	45,396	4,478	25,980	2,873	27,153	2,768
Canada.....	53,828	4,470	353,309	33,159	992,053	105,813
<b>Central American States—</b>						
Costa Rica.....	152,101	14,215	205,304	19,989	100,964	7,627
Guatemala.....	23,696	2,417	38,925	4,056	53,991	4,162
Honduras.....	22,321	2,194	37,818	4,194	34,213	3,146
Nicaragua.....	61,096	6,173	70,702	6,981	128,597	9,185
Panama.....	318,672	30,866	386,612	43,371	587,909	48,959
Salvador.....	7,764	847	9,803	1,154	17,136	1,373
Mexico.....	663,681	59,405	1,454,580	126,613	1,427,853	102,853
<b>West Indies—</b>						
British—						
Barbados.....	48,261	5,028	84,207	8,884	32,303	3,542
Jamaica.....	94,259	9,987	266,972	29,207	288,243	26,107
Trinidad and Tobago.....	189,193	19,114	202,657	22,876	169,123	17,743
Other British.....	136,207	14,272	45,805	5,360	51,239	5,865
Cuba.....	78,814	7,817	109,953	11,462	160,933	13,281
Danish.....	14,180	1,414	8,661	1,020	6,716	742
Dutch.....	18,928	2,136	22,429	2,513	27,464	2,811
French.....	1,257	118	904	97	270	28
Haiti.....	3,058	358	10,818	1,213	12,765	1,210
Dominican Republic.....	27,890	3,086	43,089	4,161	94,393	7,975
<b>South America:</b>						
Argentina.....	217,994	18,828	986,832	89,468	110,404	9,984
Bolivia.....	32,908	3,500	102,574	9,466	43,648	2,329
Brazil.....	317,809	35,171	151,717	17,348	219,492	22,820
Chile.....	1,491,089	121,833	3,986,595	345,295	2,318,720	143,574
Colombia.....	100,311	10,467	191,535	18,600	173,760	13,018
Ecuador.....	228,948	18,018	294,280	26,498	293,175	17,787
Guiana—						
British.....	118,034	13,935	152,479	16,868	214,349	22,438
Dutch.....	85,909	8,827	135,514	15,143	69,223	6,678
French.....	15,976	1,604	18,820	2,235	21,178	1,605
Paraguay.....			648	72		
Peru.....	295,235	24,170	589,285	51,855	513,311	34,129
Uruguay.....	12,940	1,294	18,897	2,292	8,633	883
Venezuela.....	89,774	9,796	127,264	14,243	148,878	17,222
<b>Asia:</b>						
Aden.....					240	21
China.....	22,188	2,867	33,504	4,340	83,568	6,760
China, leased territory—						
Japanese.....					192	22
Chosen.....	1,536	208	1,488	223	13,200	1,011
<b>East Indies—</b>						
British—						
British India.....	107,376	10,423	171,690	17,177	550,694	38,069
Straits Settlements.....	1,077,096	104,931	787,020	67,317	1,635,282	116,365
Other British.....	43,104	4,447	73,632	7,180	143,865	8,962
Dutch.....	171,840	17,937	253,026	24,813	356,448	31,084
French.....	96	8				
Hongkong.....	61,650	7,362	144,552	17,115	767,810	49,360
Japan.....	3,072	347	236,114	21,667	2,256	289
Russia in Asia.....			1,440	144		
Siam.....	960	147	960	143	39,360	2,208
Turkey in Asia.....	364	44			632	58

## EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1911		1912		1913	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Oceania:						
British—						
Australia and Tasmania...	5,812,096	\$687,854	5,494,218	\$765,678	6,331,184	\$784,379
New Zealand .....	137,088	13,791	79,924	9,569	194,836	20,377
Other British .....	172,092	14,137	33,830	4,035	53,006	4,036
French .....	241,112	28,225	231,980	31,184	335,800	34,790
German .....	268,118	22,048	283,753	22,682	381,744	27,660
Philippine Islands .....	3,069,118	225,885	5,096,810	422,001	10,122,820	590,128
Africa:						
British Africa—						
West .....			200	25	9,400	1,020
South .....	213,538	23,488	630,653	64,562	376,977	31,170
Egypt .....			7,892	861	20,936	1,808
German Africa .....	1,710	293	2,700	290	2,830	305
Liberia .....	100	12	146	15		
Portuguese Africa .....	48,490	4,611	145,738	13,409	52,460	5,029
Spanish Africa .....	26,850	2,229	650	76	800	85
Total .....	38,600,799	4,037,142	43,423,756	4,620,563	55,290,966	5,103,340
RECAPITULATION.						
Europe .....	22,134,328	2,408,708	19,545,720	2,183,982	25,408,154	2,705,254
North America .....	1,979,950	190,637	3,411,176	332,692	4,271,710	370,823
South America .....	3,006,927	266,903	6,756,440	609,383	4,134,771	292,367
Asia .....	1,489,282	148,721	1,702,426	160,119	3,593,538	254,209
Oceania .....	9,699,624	991,540	11,220,515	1,255,149	17,419,390	1,441,270
Africa .....	290,688	30,633	787,479	79,238	463,403	39,417

Countries.	1914		1915	
	Pounds.	Value.	Pounds.	Value.
Europe:				
Belgium .....	45,590	\$3,024	99,688	\$8,036
Denmark .....	75,693	6,110	858,123	80,918
France .....	14,400	1,443	14,775	1,388
Germany .....	85,738	4,870		
Gibraltar .....	5,100	541	1,200	120
Greece .....			30	3
Italy .....	6,720	644	3,864	360
Malta, Gozo, etc. ....	2,400	300		
Netherlands .....	11,000	1,100	493,350	51,031
Norway .....	3,300	320	56,530	7,341
Portugal .....			700	68
Spain .....	3,795	365	34,080	3,670
Sweden .....	7,200	700		
Turkey in Europe .....	1,500	150	600	57
United Kingdom—				
England .....	62,318,612	5,982,247	62,053,818	6,944,736
Scotland .....	274,080	23,906	144,000	13,000
Ireland .....	7,200	450		
North America:				
Bermuda .....	43,346	3,986	62,493	5,936
British Honduras .....	31,486	3,430	28,392	3,071
Canada .....	3,632,465	314,917	2,118,808	168,487
Central American States—				
Costa Rica .....	149,848	10,247	54,846	4,960
Guatemala .....	46,171	3,744	17,183	1,656
Honduras .....	57,387	5,821	40,645	4,330
Nicaragua .....	50,497	3,880	20,656	1,940
Panama .....	367,678	31,350	397,172	41,269
Salvador .....	13,806	1,050	8,474	797
Mexico .....	754,172	53,665	636,649	53,816
Miquelon, Langley, etc. ....			48	4
Newfoundland and Labrador ..			980	98
West Indies—				
British—				
Barbados .....	77,836	6,013	41,375	3,591
Jamaica .....	188,856	17,805	84,950	7,520
Trinidad and Tobago .....	175,590	16,171	201,665	21,681
Other British .....	73,274	7,158	68,507	7,795
Cuba .....	306,749	21,917	408,874	31,934
Danish .....	13,259	1,273	9,934	886
Dutch .....	34,511	3,181	28,855	2,809
French .....	894	95	1,773	162
Haiti .....	2,670	260	1,478	110
Dominican Republic .....	77,120	5,682	94,489	7,232

## EXPORTS, BY COUNTRIES, OF DOMESTIC CANNED SALMON, 1900 TO 1915—Continued.

Countries.	1914		1915	
	Pounds.	Value.	Pounds.	Value.
South America:				
Argentina.....	51,444	\$4,472	185,826	\$16,860
Bolivia.....	26,904	1,634	22,080	1,710
Brazil.....	80,129	7,211	28,799	2,883
Chile.....	2,123,237	134,678	326,579	22,734
Colombia.....	183,508	12,760	94,659	8,187
Ecuador.....	277,488	15,280	207,104	15,458
Guiana—				
British.....	132,455	13,444	110,516	11,752
Dutch.....	97,859	8,153	57,134	5,486
French.....	7,266	665	18,434	1,647
Peru.....	301,374	19,091	79,642	6,591
Uruguay.....	4,660	351	3,922	379
Venezuela.....	186,074	15,936	167,267	14,096
Asia:				
Aden.....	552	28	.....	.....
China.....	45,504	3,980	66,673	6,779
China, leased territory—				
British.....	1,920	200	.....	.....
Chosen.....	2,928	266	816	102
East Indies—				
British—				
British India.....	327,817	21,168	301,654	26,639
Straits Settlements.....	1,541,408	90,292	266,172	20,949
Other British.....	135,840	9,141	132,380	10,488
Dutch.....	331,776	22,408	309,154	26,815
French.....	624	43	2,400	220
Hongkong.....	480,036	32,109	47,472	4,587
Japan.....	2,614	274	5,000	518
Russia in Asia.....	144	13	470	56
Siam.....	480	60	3,552	502
Turkey in Asia.....	4,352	420	50	7
Oceania:				
British—				
Australia and Tasmania.....	5,961,723	666,703	7,367,824	957,058
New Zealand.....	95,136	9,289	118,032	13,780
Other British.....	73,984	5,168	36,050	3,524
French.....	389,424	37,218	223,008	24,139
German.....	534,484	33,247	295,920	22,327
Philippine Islands.....	5,034,252	266,369	4,059,580	288,548
Africa:				
British Africa—				
West.....	.....	.....	109,728	10,749
South.....	295,607	24,561	598,223	55,079
Canary Islands.....	.....	.....	542	66
Egypt.....	15,024	1,059	38,800	3,160
German Africa.....	2,860	306	.....	.....
Italian Africa.....	2,400	230	.....	.....
Liberia.....	.....	.....	4,820	412
Portuguese Africa.....	36,650	3,238	65,530	6,859
Spanish Africa.....	1,000	113	1,300	125
Total.....	87,750,920	7,999,293	83,446,116	9,072,083
RECAPITULATION.				
Europe.....	62,862,328	6,026,170	63,760,758	7,110,728
North America.....	6,907,615	511,545	4,328,246	370,444
South America.....	3,472,438	233,675	1,301,962	107,783
Asia.....	2,875,995	180,402	1,135,793	97,662
Oceania.....	12,089,003	1,017,994	12,100,414	1,309,376
Africa.....	353,541	29,507	818,943	76,450

The table following shows for the past 16 years the customs districts from which the canned salmon was exported. Up to 1910 about two-thirds of the total exports have gone from the port of San Francisco, while about one-fifth of the total passed through the port of Puget Sound, Wash. In 1910, however, the exports from Puget Sound exceeded those from San Francisco. The only other port through which any considerable quantity is shipped is New York

City. It is usual now to load the salmon on steamers and sailing vessels at San Francisco and the Puget Sound cities to go direct to Europe.

## EXPORTS, BY CUSTOMS DISTRICTS, OF CANNED SALMON, 1900 TO 1915.

Customs districts from which exported.	1900		1901		1902	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Atlantic ports:						
Baltimore, Md. ....	648	\$65	334,580	\$33,053	324	\$34
Bangor, Me. ....					10	1
Boston and Charlestown, Mass. ....	222,770	20,488	192,676	27,372	172,110	20,224
New York, N. Y. ....	3,485,326	340,538	7,960,104	847,294	4,365,074	407,009
Philadelphia, Pa. ....	110,500	9,100	77,000	9,050		
Savannah, Ga. ....	1,012	81	582	72	480	60
St. Johns, Fla. ....					75	7
Norfolk and Portsmouth, Va. ....			269,380	30,888		
Charleston, S. C. ....	400	30				
Gulf ports:						
Key West, Fla. ....			400	43		
Mobile, Ala. ....	10,536	958	7,340	816	11,032	1,055
New Orleans, La. ....	28,332	2,472	47,685	4,567	39,084	3,910
Mexican border ports:						
Arizona. ....	6,253	706	18,104	1,869	23,879	2,350
Brazos de Santiago, Tex. ....	168	21	816	115	300	29
Paso del Norte, Tex. ....	23,843	2,134	1,220	98	164,167	13,119
Pacific ports:						
Alaska. ....	289	38	4,859	291	3,636	558
Hawaii. ....					48	4
Puget Sound, Wash. ....	1,477,232	144,059	2,271,306	282,441	9,864,259	872,912
San Diego, Cal. ....	3,094	220	3,574	293	6,202	487
San Francisco, Cal. ....	21,611,030	2,164,904	30,014,905	2,983,982	32,327,572	2,654,020
Willamette, Oreg. ....	76,800	5,320	43,818	3,517	155,500	11,250
Northern border and Lake ports:						
Detroit, Mich. ....			26,200	2,700		
Minnesota, Minn. ....			101	10		
Vermont, Vt. ....	120	12				
Duluth, Minn. ....	24,000	2,500	16,200	1,800	39,312	4,368
Memphremagog, Vt. ....	17	2			50	5
Total. ....	27,082,370	2,693,648	41,289,500	4,230,271	47,173,114	3,991,402
RECAPITULATION.						
Atlantic ports. ....	3,820,656	370,302	8,834,322	947,729	4,538,073	427,335
Gulf ports. ....	38,868	3,430	55,425	5,426	50,116	4,965
Mexican border ports. ....	30,264	2,861	20,140	2,082	188,346	15,498
Pacific ports. ....	23,168,445	2,314,541	32,337,112	3,270,524	42,357,217	3,539,231
Northern border and Lake ports. ....	24,137	2,514	42,501	4,510	39,362	4,373
Customs districts from which exported.						
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Atlantic ports:						
Baltimore, Md. ....	840	\$92	490	\$50	576	\$62
Bangor, Me. ....			121	9	294	26
Boston and Charlestown, Mass. ....	104,750	12,266	2,400	215		
New York, N. Y. ....	5,627,654	599,393	2,129,523	214,016	2,683,775	266,599
Philadelphia, Pa. ....	540	54	587	42	8,858	576
Providence, R. I. ....	685	63				
Gulf ports:						
Key West, Fla. ....			1,500	125	460	23
Mobile, Ala. ....	9,612	824	9,203	811	7,102	561
New Orleans, La. ....	44,404	4,261	61,909	5,503	89,999	7,841
Tampa, Fla. ....			180	16		
Mexican border ports:						
Arizona. ....	26,988	2,803	7,568	745	20,845	1,878
Brazos de Santiago, Tex. ....			96	7		
Paso del Norte, Tex. ....	103,375	8,938	347,218	23,401	262,014	20,687
Saluria, Tex. ....			366	30	6,580	583

## EXPORTS, BY CUSTOMS DISTRICTS, OF CANNED SALMON, 1900 TO 1915—Continued.

Customs districts from which exported.	1903		1904		1905	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Pacific ports:						
Alaska.....			153,600	\$9,550	4,848	\$557
Hawaii.....			48	7	148	15
Puget Sound, Wash.....	16,527,456	\$1,549,319	19,766,003	1,655,666	4,444,562	326,485
San Diego, Cal.....	5,897	421	5,678	422	3,594	259
San Francisco, Cal.....	27,448,182	2,138,019	33,212,614	3,303,292	27,498,325	2,406,422
Willamette, Oreg.....	409,444	29,142	224,549	10,628	5,775	531
Oregon, Oreg.....	400	25				
Northern border and Lake ports:						
Detroit, Mich.....			580	58		
North and South Dakota.....			20	2		
Superior, Mich.....					28,800	2,364
Vermont, Vt.....	74	7	25	3		
Duluth, Minn.....	43,033	5,164				
Total.....	50,353,334	4,350,791	55,924,278	5,224,593	35,066,555	3,035,469
RECAPITULATION.						
Atlantic ports.....	5,734,469	611,868	2,133,121	214,332	2,693,503	267,263
Gulf ports.....	54,016	5,085	72,792	6,455	97,561	8,425
Mexican border ports.....	130,363	11,741	355,248	24,183	289,439	23,148
Pacific ports.....	44,391,379	3,716,926	53,362,492	4,979,565	31,957,252	2,734,269
Northern border and Lake ports.....	43,107	5,171	625	63	28,800	2,364

Customs districts from which exported.	1906		1907		1908	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Atlantic ports:						
Baltimore, Md.....	196	\$21	156	\$28	301	\$37
New York, N. Y.....	3,275,875	318,128	2,313,335	227,646	2,332,392	226,850
Philadelphia, Pa.....	1,400	159	722	67	720	71
Portland and Falmouth, Me.....	100	13				
St. Johns, Fla.....			322	38	1,250	155
Gulf ports:						
Galveston, Tex.....	60	8	40,213	3,216	292	23
Key West, Fla.....	890	94	312	25	190	18
Mobile, Ala.....	38,267	3,031	11,675	992	10,823	1,051
New Orleans, La.....	88,014	7,775	112,850	10,217	194,711	18,144
Sabine, Tex.....					104	9
Tampa, Fla.....	24	2				
Mexican border ports:						
Arizona.....	45,883	4,128	34,479	3,268	43,035	3,856
Corpus Christi, Tex.....					30,930	2,775
Paso del Norte, Tex.....	387,568	30,336	513,202	42,548	626,837	56,147
Saluria, Tex.....	21,962	1,666	22,662	1,960	22,887	2,341
Pacific ports:						
Alaska.....			305,294	33,315	790	99
Hawaii.....					144	14
Los Angeles, Cal.....	840	53				
Puget Sound, Wash.....	17,286,930	1,499,819	9,340,000	845,982	6,351,440	528,558
San Diego, Cal.....	4,228	331	8,456	661	6,994	567
San Francisco, Cal.....	24,613,868	1,969,214	12,502,876	1,012,199	18,601,705	1,597,735
Willamette, Oreg.....	540	55	3,723	241	100	22
Northern border and Lake ports:						
Huron, Mich.....	177,734	13,107	7,000	570		
Minnesota, Minn.....			48	5		
Oswegatchie, N. Y.....			780	71	400	46
Vermont, Vt.....	35	3				
Total.....	45,944,414	3,847,943	25,218,105	2,183,049	28,226,045	2,438,518
RECAPITULATION.						
Atlantic ports.....	3,277,571	318,321	2,314,535	227,779	2,334,663	227,113
Gulf ports.....	127,255	10,910	165,050	14,450	206,120	19,245
Mexican border ports.....	455,413	36,130	570,343	47,776	723,689	65,119
Pacific ports.....	41,906,406	3,469,472	22,160,349	1,892,398	24,961,173	2,126,995
Northern border and Lake ports.....	177,769	13,110	7,828	646	400	46

## EXPORTS, BY CUSTOMS DISTRICTS, OF CANNED SALMON, 1900 TO 1915—Continued.

Customs districts from which exported.	1909		1910	
	Pounds.	Value.	Pounds.	Value.
Atlantic ports:				
Baltimore, Md.....	192	\$22	36	\$3
Bangor, Me.....	216	25		
Boston and Charlestown, Mass.....	162,024	16,837	3,000	280
New York, N. Y.....	3,848,870	390,266	2,999,480	305,732
Philadelphia, Pa.....	405	44	700	89
Norfolk and Portsmouth, Va.....	32,100	2,739		
Perth Amboy, N. J.....			214	18
Gulf ports:				
Galveston, Tex.....	876	88	155	12
Key West, Fla.....	40	4	340	27
Mobile, Ala.....	13,565	1,247	14,018	1,322
New Orleans, La.....	92,537	7,615	103,980	8,187
Tampa, Fla.....			66	6
Mexican border ports:				
Arizona.....	27,735	2,733	54,425	4,612
Brazos de Santiago, Tex.....	138	13	641	64
Corpus Christi, Tex.....	26,220	2,450	27,365	2,414
Paso del Norte, Tex.....	150,636	14,850	125,169	11,560
Saluria, Tex.....	14,399	1,528	47,117	2,853
Pacific ports:				
Alaska.....	66,020	6,263		
Los Angeles, Cal.....	13,370	934	9,229	820
Puget Sound, Wash.....	7,858,552	716,370	32,406,617	3,331,174
San Diego, Cal.....	5,546	460	6,355	583
San Francisco, Cal.....	23,761,656	2,247,957	28,027,911	2,641,608
Willamette, Ore.....			78	11
Northern border and Lake ports:				
Detroit, Mich.....	42,000	3,990		
North and South Dakota.....	12	1		
Duluth, Minn.....			33,200	2,800
Montana and Idaho.....			600	83
Total.....	36,117,109	3,416,436	63,860,696	6,314,258
RECAPITULATION.				
Atlantic ports.....	4,043,807	409,933	3,003,430	306,122
Gulf ports.....	107,018	8,954	118,559	9,554
Mexican border ports.....	219,128	21,574	254,717	21,503
Pacific ports.....	31,705,144	2,971,984	60,450,190	5,974,196
Northern border and Lake ports.....	42,012	3,991	33,800	2,883

Customs districts from which exported.	1911		1912	
	Pounds.	Value.	Pounds.	Value.
Atlantic ports:				
Baltimore, Md.....	63	\$10	13	\$4
Bangor, Me.....	96	11		
Boston and Charlestown, Mass.....			24	5
Jacksonville, Fla.....			48	8
New York, N. Y.....	1,563,285	166,819	2,505,950	257,647
Perth Amboy, N. J.....	440	42	690	97
Philadelphia, Pa.....	601	89	264	31
Gulf ports:				
Galveston, Tex.....	48	4		
Key West, Fla.....	232	28		
Mobile, Ala.....	19,512	1,873	5,313	515
New Orleans, La.....	139,567	13,284	103,732	11,514
Mexican border ports:				
Arizona.....	21,915	2,180	23,631	2,052
Brazos de Santiago, Tex.....	554	48		
Corpus Christi, Tex.....	32,863	3,232	64,114	6,962
Paso del Norte, Tex.....	131,258	12,438	275,768	25,297
Saluria, Tex.....	26,636	2,495	51,746	4,144
Pacific ports:				
Alaska.....			351,552	32,958
Hawaii.....	24	4	24	5
Los Angeles, Cal.....	3,148	308		
Portland, Ore.....	1,730	133	1,093,200	109,295
Puget Sound, Wash.....	10,622,314	1,043,813	19,337,626	1,866,541
San Diego, Cal.....	9,055	820	17,047	1,585
San Francisco, Cal.....	26,027,458	2,789,506	19,591,609	2,301,732

## EXPORTS, BY CUSTOMS DISTRICTS, OF CANNED SALMON, 1900 TO 1915—Continued.

Customs districts from which exported.	1911		1912	
	Pounds.	Value.	Pounds.	Value.
Northern border and Lake ports: Superior, Mich.....			1,405	\$171
Total.....	38,600,799	\$4,037,142	43,423,756	4,620,563
RECAPITULATION.				
Atlantic ports.....	1,564,485	166,971	2,506,989	257,792
Gulf ports.....	159,359	15,194	109,045	12,029
Mexican border ports.....	213,226	20,393	415,259	38,455
Pacific ports.....	36,663,729	3,834,584	40,391,058	4,312,116
Northern border and Lake ports.....			1,405	171

Customs districts from which exported.	1913		1914		1915	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
New York.....	1,935,881	\$189,959	2,404,220	\$207,924	5,316,456	\$512,549
New Orleans.....			182,717	19,787	261,709	28,682
El Paso.....			120,140	9,045	176,390	12,348
San Francisco.....	31,687,774	3,277,841	38,844,912	3,600,636	35,321,058	4,209,914
Oregon.....	624,000	83,000	124,512	9,391	671,452	64,517
Washington.....	19,827,745	1,434,451	45,876,703	4,138,449	41,064,868	4,183,410
All other districts.....	1,215,566	118,089	197,716	14,061	634,183	60,663
Total.....	55,290,966	5,103,340	87,750,920	7,999,293	83,446,116	9,072,083

## EXPORTS OF FRESH AND CURED SALMON.

The following table shows, by countries, the value of the exports of fresh and cured salmon for the period 1900 to 1914, inclusive. As with the canned salmon, the greater part of these exports go to European countries, Germany taking by far the largest quantity. A small portion of this is salmon caught in eastern waters.

## EXPORTS, BY COUNTRIES RECEIVING, OF DOMESTIC PICKLED, FRESH, ETC., SALMON, 1900 TO 1914.

Exported to—	1900	1901	1902	1903	1904	1905
<b>Europe:</b>						
Azores, and Madeira Islands.....	\$3				\$123	\$85
Belgium.....		\$1,062	\$88		4,750	
Denmark.....	378	15,285	16,904	\$653	2,315	22,952
France.....	180	300			57	
Germany.....	300,291	320,369	470,657	741,634	1,061,944	1,666,787
Greece.....						158
Italy.....						100
Malta, Gozo, etc.....	475	55	280	28		
Netherlands.....	50	184	3,023	4,127	3,105	300
Norway.....				12,765	12,295	7,896
Russia in Europe.....	300					2,574
Spain.....						56
Sweden.....	7	5,595	5,685		1,838	17,776
United Kingdom.....	38,959	1,528		990	8,523	29,355
<b>North America:</b>						
Bermuda.....	88	14	11	21		246
British Honduras.....	7	9		22	120	94
Dominion of Canada—						
Nova Scotia, New Brunswick, etc.					418	3
Quebec, Ontario, Manitoba, etc.	1,516	2,555	1,051	6,083	3,572	7,499
British Columbia.....	80,652	53,922	125,916	53,592	25,913	10,299



EXPORTS, BY COUNTRIES RECEIVING, OF DOMESTIC PICKLED, FRESH, ETC., SALMON,  
1900 TO 1915—Continued.

Exported to—	1900	1901	1902	1903	1904	1905
North America—Continued.						
Central American States—						
Costa Rica.....	\$220	\$703	\$218	\$178	\$340	\$192
Guatemala.....			27	11	1	208
Honduras.....		5		1	2	26
Nicaragua.....	53	26	40	78	40	75
Panama.....					167	315
Salvador.....		22		7		
Mexico.....	1,330	664	1,925	1,397	1,266	1,136
West Indies—						
British.....	943	939	2,348	5,150	3,867	4,999
Cuba.....	429	376	273	114	194	162
Danish.....	12	31	38	84	13	67
Dutch.....	195	167	293	177	197	238
French.....	126	122	315	199	273	100
Haiti.....	181	191	164	54	11	124
Porto Rico.....	1,214					
Dominican Republic.....	998	670	85	57	14	26
South America:						
Argentina.....					143	1,641
Bolivia.....			1,200			
Brazil.....	172	38	419	385	227	1,160
Chile.....	142			70	164	
Colombia.....	416	223	657	441	17	
Ecuador.....			65			15
Guiana—						
British.....	30	82	30	262	60	161
Dutch.....	400	226	286	11	766	176
French.....	420	290	134	434	251	65
Peru.....	26		27	62	194	112
Venezuela.....	96	42	245	25		108
Asia:						
Chinese Empire.....		400	25	9	54	201
China—Russian.....				15		
East Indies—						
British.....		121	71	30	115	135
Dutch.....					275	
Hongkong.....	507		519	1,840	462	4,797
Japan.....	2,807	14,516	25,228	3,499	476	25,037
Russia—Asiatic.....	10					
Oceania:						
British Australasia.....	39,867	618	33,785	31,503	25,208	21,595
All other British Oceania.....			346	29	27	22
French Oceania.....	1,958	1,729	1,325	1,877	1,838	2,299
German Oceania.....			13	948	977	861
Guam.....	57	3,420				
Hawaii.....	58,870					
Philippine Islands.....			384	478	13	308
Tonga, Samoa, and all other.....	636	215				
Tutuila.....			10			
Africa:						
British Africa—						
West.....			304			
South.....	170	24	21	12	859	114
French Africa.....	85					
Liberia.....					5	
Total.....	535,276	426,738	694,435	869,352	1,163,489	1,832,655
RECAPITULATION.						
Europe.....	340,643	344,368	496,637	760,197	1,094,950	1,748,039
North America.....	87,964	60,416	132,704	67,225	36,408	25,809
South America.....	1,702	901	3,063	1,690	1,822	3,438
Asia.....	3,324	15,037	25,843	5,303	1,382	30,170
Oceania.....	101,388	5,982	35,863	34,835	28,063	25,085
Africa.....	255	24	325	12	864	114

EXPORTS, BY COUNTRIES RECEIVING, OF DOMESTIC PICKLED, FRESH, ETC., SALMON,  
1900 TO 1915—Continued.

Exported to—	1906	1907	1908	1909	1910
<b>Europe:</b>					
Azores, and Madeira Islands.....		\$95			
Belgium.....	\$114			\$410	
Denmark.....	36,623	108,269	\$90,015	81,195	\$83,580
France.....		150		250	415
Germany.....	1,670,366	1,601,166	1,422,846	1,038,530	1,223,595
Italy.....	137				
Netherlands.....	793	264	2,947		
Norway.....	9,303	11,390	22,104	22,917	45,885
Portugal.....		1,650			
Russia in Europe.....		140		14,735	5,260
Spain.....		55		289	
Sweden.....	32,554	23,469	21,540	23,670	42,725
United Kingdom.....	26,196	48,237	28,083	43,952	66,555
<b>North America:</b>					
Bermuda.....	173	20	23	68	630
British Honduras.....	14		1,036		
Dominion of Canada—Nova Scotia, New Brunswick, etc.....	32,925	18,785	16,964	21,973	23,559
Central American States—					
Costa Rica.....	46	213	189	217	197
Guatemala.....	40		902	18	62
Honduras.....		92	2,451		
Nicaragua.....	39	27	1,317	31	11
Panama.....	380	2,211	1,878	175	775
Mexico.....	1,231	528	460	199	555
West Indies—					
British.....	1,646	208	975	4,890	3,067
Cuba.....	128	371	104	121	97
Danish.....	30	108	39	165	42
Dutch.....	94	93		49	78
French.....		16	19	14	19
Haiti.....	97	277	678	335	283
Dominican Republic.....	100	255	228	128	313
<b>South America:</b>					
Argentina.....	85	500			
Brazil.....	308			120	3,029
Chile.....	15	20	56		
Colombia.....	105	67	90	22	167
Ecuador.....		391		290	
Guiana—					
British.....	218	5	48	76	823
Dutch.....	287	133	130	271	217
French.....	57	36	75	21	695
Peru.....	1,317	1,163	118	555	
Venezuela.....	208	36			311
Uruguay.....				10	
<b>Asia:</b>					
Chinese Empire.....	3,391	293	170	41	89
East Indies—					
British.....	63		66	18	60
Dutch.....					41
Hongkong.....	1,339	687	13	809	10
Japan.....	88,068	18,395	3,592	2,772	90
Korea.....		3			3
Russia—Asiatic.....		6	121		
Turkey in Asia.....					55
<b>Oceania:</b>					
British Australasia.....	15,169	23,186	26,591	25,466	22,826
All other British Oceania.....	21		11		89
French Oceania.....	2,154	2,136	1,792	1,528	1,886
German Oceania.....	749	1,112	373	1,229	1,189
Philippine Islands.....	821	12,287		712	2,089
<b>Africa:</b>					
British Africa—South.....	20				1,268
Liberia.....	40				
Portuguese Africa.....			198		
Spanish Africa.....				289	
<b>Total.....</b>	<b>1,927,464</b>	<b>1,878,743</b>	<b>1,648,044</b>	<b>1,288,560</b>	<b>1,532,640</b>
<b>RECAPITULATION.</b>					
Europe.....	1,776,086	1,794,885	1,587,535	1,225,948	1,468,015
North America.....	36,943	23,204	27,263	28,383	29,688
South America.....	2,600	2,351	517	1,365	5,242
Asia.....	92,861	19,384	3,962	3,640	348
Oceania.....	18,914	38,721	28,767	28,935	28,079
Africa.....	60	198		289	1,268

EXPORTS, BY COUNTRIES RECEIVING, OF DOMESTIC PICKLED, FRESH, ETC., SALMON,  
1900 TO 1915—Continued.

Exported to—	1911	1912	1913	1914	1915
Europe:				\$75	
Austria-Hungary.....			\$730		\$5
Belgium.....		\$72,661	53,494	84,727	717,157
Denmark.....	\$65,472	15,605	12,582	18,395	2,840
Finland.....	16,515	4,427	400	3,061	498
France.....	150				109,399
Germany.....	1,320,055	1,358,545	1,857,500	1,837,624	300
Greece.....					10,000
Italy.....				7,550	
Netherlands.....	1,267	27,953	2,100	38,886	415,090
Norway.....	14,437	130	23,516		
Russia in Europe.....		49,699	44,635	34,312	43,460
Sweden.....	33,382	58,950	60,152	49,869	76,374
United Kingdom—England.....	59,906				
North America:					
Bermuda.....	94	332		324	138
British Honduras.....	307			276	
Canada.....	20,539	17,457	31,562	82,742	15,458
Central American States—					
Costa Rica.....	98	91	227	127	34
Guatemala.....	111	12	7	18	90
Honduras.....	179				
Nicaragua.....	347	13	10	2	9
Panama.....	198	167	1,009	395	1,544
Salvador.....		28		23	41
Mexico.....	21	319	450	584	250
Miguelon, Langley, etc.....					16
Newfoundland and Labrador.....					17
West Indies—					
British—					
Barbados.....	956		250		520
Jamaica.....	7		3	41	176
Trinidad and Tobago.....	135		45	253	576
Other British.....	41	110			17
Cuba.....	778	138	457	233	637
Danish.....			123	47	16
Dutch.....	34	81	49	86	136
French.....		124			
Haiti.....	731	800	16	385	154
Dominican Republic.....	304	678	533	551	507
South America:					
Bolivia.....			30		
Brazil.....	225	80	173		95
Chile.....	2		14	238	
Colombia.....	71	43	3,162		27
Ecuador.....				109	15
Guiana—					
British.....	28			470	
Dutch.....				78	140
French.....			16		7
Peru.....	24		14		290
Venezuela.....	34	19		18	44
Asia:					
China.....	299	21	39	122	8
China, leased terr.—Japanese.....					820
Chosen.....	8	45	25	26	3
East Indies—British—					
British India.....		31	522	28	
Other British.....	7				9
Hongkong.....	1,330		779	1,960	370
Japan.....	2,289	10	33	292	50
Russia in Asia.....					102
Turkey in Asia.....					
Oceania:					
British—					
Australia and Tasmania.....	23,838	14,682	17,972	26,559	25,271
New Zealand.....	1,101	128	2,795	364	201
Other British.....	335	67	49	74	117
French.....	1,834	2,241	1,222	1,425	1,012
German.....	1,684	2,020	1,727	727	494
Philippine Islands.....	3,542	2,437	1,934	2,181	325
Africa:					
British Africa—					
South.....		4	1,210		
East.....	424				
Egypt.....				32	
French Africa.....			1,000		
Total.....	1,573,139	1,630,151	2,122,566	2,195,309	1,424,859

EXPORTS, BY COUNTRIES RECEIVING, OF DOMESTIC PICKLED, FRESH, ETC., SALMON,  
1900 TO 1915—Continued.

Exported to—	1911	1912	1913	1914	1915
RECAPITULATION.					
Europe.....	\$1,511,184	\$1,587,973	\$2,055,109	\$2,074,499	\$1,375,123
North America.....	24,880	20,350	34,741	86,087	20,336
South America.....	384	142	3,409	933	618
Asia.....	3,933	107	1,398	2,428	1,362
Oceania.....	32,334	21,575	25,699	31,330	27,420
Africa.....	424	4	2,210	32	.....

The exports of domestic fresh and cured salmon from 1900 to 1915, inclusive, are shown below, by customs districts. The greater part of the shipments pass through the New York City customs district:

EXPORTS, BY CUSTOMS DISTRICTS, OF DOMESTIC PICKLED, FRESH, ETC., SALMON,  
1900 TO 1915.

Customs districts from which exported.	1900	1901	1902	1903	1904	1905
<b>Atlantic ports:</b>						
Baltimore, Md.....	.....	.....	\$158	.....	.....	\$8
Bangor, Me.....	.....	.....	.....	.....	.....	3
Belfast, Me.....	\$12	\$17	12	\$19	\$7	.....
Boston and Charlestown, Mass.....	16	.....	34	52	418	.....
New York, N. Y.....	346,853	330,805	503,219	766,128	1,102,542	1,757,742
Philadelphia, Pa.....	10	.....	.....	1,151	7	.....
Portland and Falmouth, Me.....	11	68	16	47	60	79
Savannah, Ga.....	22	.....	.....	.....	.....	.....
<b>Gulf ports:</b>						
Mobile, Ala.....	.....	.....	.....	30	8	96
New Orleans, La.....	.....	5	143	.....	116	63
<b>Mexican border ports:</b>						
Arizona.....	18	85	416	115	.....	14
Brazos de Santiago, Tex.....	.....	.....	.....	19	4	.....
Corpus Christi, Tex.....	414	13	.....	30	208	.....
Paso del Norte, Tex.....	760	67	13	.....	80	206
Saluria, Tex.....	.....	370	1,428	1,063	868	777
<b>Pacific ports:</b>						
Alaska.....	2,377	12,422	293	4,375	1,003	1,184
Oregon, Ore.....	.....	17,500	.....	.....	.....	.....
Puget Sound, Wash.....	80,493	55,727	150,906	58,278	29,212	36,145
San Diego, Cal.....	108	19	20	34	73	4
San Francisco, Cal.....	102,666	7,030	36,958	36,331	25,851	27,939
Willamette, Ore.....	.....	.....	.....	.....	28	1,500
<b>Northern border and Lake ports:</b>						
Champlain, N. Y.....	234	1,464	449	1,542	1,183	2,142
Detroit, Mich.....	.....	742	24	.....	1,393	4,445
Genesee, N. Y.....	.....	.....	.....	.....	26	.....
Huron, Mich.....	456	121	225	55	.....	.....
Memphremagog, Vt.....	.....	.....	6	7	24	.....
Montana and Idaho.....	2	6	.....	.....	.....	6
North and South Dakota.....	523	162	95	36	378	247
Superior, Mich.....	.....	.....	.....	.....	.....	33
Vermont, Vt.....	301	115	20	40	.....	22
Total.....	535,276	426,738	694,435	869,352	1,163,489	1,832,655
RECAPITULATION.						
Atlantic Ports.....	346,924	330,890	503,439	767,397	1,103,034	1,757,832
Gulf ports.....	.....	5	143	30	124	159
Mexican border ports.....	1,192	535	1,857	1,227	1,160	997
Pacific ports.....	185,644	92,698	188,177	99,018	56,167	66,772
Northern border and Lake ports.....	1,516	2,610	819	1,680	3,004	6,895

**EXPORTS, BY CUSTOMS DISTRICTS, OF DOMESTIC PICKLED, FRESH, ETC., SALMON,  
1900 TO 1915—Continued.**

Customs districts from which exported.	1906	1907	1908	1909	1910	1911	1912
<b>Atlantic ports:</b>							
Baltimore, Md.	\$11			\$31		\$36	\$77
Bangor, Me.			\$7	58			2
Belfast, Me.	15	\$8		11	\$12		
New York, N. Y.	1,781,330	1,786,105	1,590,757	1,230,436	1,479,625	1,514,563	1,586,221
Philadelphia, Pa.	105						
Portland and Falmouth, Me.	15	11,298	14	6	19		
Perth Amboy, N. J.							19
<b>Gulf ports:</b>							
Mobile, Ala.	14		128			201	
New Orleans, La.		276	7,098	49	74	1,341	
<b>Mexican border ports:</b>							
Arizona.	700	134	13	25		14	6
Brazos de Santiago, Tex.					5		
Corpus Christi, Tex.						4	140
Paso del Norte, Tex.	8	290	154				
Saluria, Tex.	80				197		56
<b>Pacific ports:</b>							
Alaska.	44,436	451	803	1,091	212	4,517	2,532
Portland, Oreg.						1,330	
Puget Sound, Wash.	63,626	44,492	14,370	11,677	22,666	10,349	11,191
San Diego, Cal.	44		28	4	12	3	
San Francisco, Cal.	31,500	28,984	29,112	37,305	27,628	29,968	19,467
Willamette, Oreg.				743	3		
Hawaii.				14			
<b>Northern border and Lake ports:</b>							
Buffalo Creek, N. Y.				3,069			1,030
Cape Vincent, N. Y.		92					
Champlain, N. Y.	992	4,333	1,359	2,079	598	9,616	3,928
Detroit, Mich.	3,954	1,972	1,667			12	
Duluth, Minn.					68		108
Huron, Mich.	428		284	891		247	
Memphremagog, Vt.					20		
Minnesota, Minn.	40	52	798	59		301	21
Montana and Idaho.	69	92	45	154	82	65	
Niagara, N. Y.						426	799
North and South Dakota.	36	3	20			10	
Superior, Mich.							4,427
Vermont, Vt.	61	161	1,387	858	1,419	136	127
<b>Total.</b>	<b>1,927,464</b>	<b>1,878,743</b>	<b>1,648,044</b>	<b>1,288,560</b>	<b>1,532,640</b>	<b>1,573,139</b>	<b>1,630,151</b>
<b>RECAPITULATION.</b>							
Atlantic ports.	1,781,476	1,797,411	1,590,778	1,230,542	1,479,656	1,514,599	1,586,319
Gulf ports.	14	276	7,226	49	74	1,542	
Mexican border ports.	788	424	167	25	202	18	202
Pacific ports.	139,606	73,927	44,313	50,834	50,521	46,167	33,190
Northern border and Lake ports.	5,580	6,705	5,560	7,110	2,187	10,813	10,440

Customs districts from which exported.	1913	1914	1915	Customs districts from which exported.	1913	1914	1915
New York.	\$2,060,068	\$2,067,366	\$1,377,840	All other districts..	\$8,119	\$21,418	\$9,592
Alaska.	20,995	16,932	6,630				
Puget Sound.	7,354	59,713	2,020				
San Francisco.	26,030	29,880	28,777	Total.	2,122,566	2,195,309	1,424,859

## IMPORTS OF FRESH SALMON.

For some years it has been the custom of the canneries on Puget Sound, when fish were scarce on the American side and abundant on the Canadian side, to import fresh salmon to fill out the domestic supply, and the Canadian canneries would do the same when the conditions were reversed. In 1904 the Canadian Government prohibited the export of fresh sockeye salmon to Puget Sound for packing purposes, and in 1910 an effort was made to have Congress retaliate by enacting a similar law for this side of the line, but the bill failed of passage.

The table below shows the yearly imports of fresh salmon from British Columbia:

IMPORTS OF FRESH SALMON FROM BRITISH COLUMBIA, CANADA, FOR A SERIES OF YEARS.<sup>a</sup>

Years.	Pounds.	Value.	Years.	Pounds.	Value.	Years.	Pounds.	Value.
1890.....	4,660	\$241	1897.....	93,454	\$2,681	1904.....	40,610	\$1,025
1891.....	4,950	170	1898.....	11,580	278	1905.....	1,015	35
1892.....	6,288	301	1899.....	58,002	4,101	1906.....	3,457,738	64,408
1893.....	64,811	3,639	1900.....	19,404	855	1907.....	113,224	4,131
1894.....	3,872	219	1901.....	27,072	2,050	1908.....	8,880	795
1895.....	14,000	1,403	1902.....	22,353	739	1909.....	41,073	2,346
1896.....	11,799	419	1903.....	6,860	343	1910.....	198,251	10,116

<sup>a</sup> After 1909 all imports of fresh salmon are listed under "Fish, fresh."

## IMPORTS OF CURED SALMON.

Below are shown the imports into this country of foreign-cured salmon, the product of the Pacific salmon fisheries, from 1886 to 1909, inclusive.

IMPORTS OF FOREIGN PICKLED PACIFIC SALMON, 1886 TO 1909.<sup>a</sup>

Years.	British Columbia.		Japan.		Hongkong.		Russia, Asiatic:		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1886.....	5,600	\$224							5,600	\$224
1887.....	200	4							200	4
1888.....	86,000	4,031							86,000	4,031
1889.....	18,200	860							18,200	860
1890.....	600	36							600	36
1891.....	200	5							200	5
1892.....										
1893.....	5,478	291							5,478	291
1894.....	149,410	17,592			1,200	\$29	11,875	\$298	162,485	17,919
1895.....	6,550	250			600	13			7,150	263
1896.....	6,530	474							6,530	474
1897.....	6,890	156							6,890	156
1898.....	4,145	188			30	2	9,870	266	14,045	456
1899.....	15,875	1,554							15,875	1,554
1900.....	162,558	11,061	600	\$41					163,158	11,102
1901.....	165,243	11,225							165,243	11,225
1902.....	175,411	13,794	606	28					176,017	13,822
1903.....	161,549	11,756	360	18					161,909	11,774
1904.....	282,210	23,319	1,400	52					283,610	23,371
1905.....	282,027	25,584	3,015	133					285,042	25,717
1906.....	35,475	1,730	5,510	175					40,985	1,905
1907.....	6,393	322	680	31					7,073	353
1908.....	13,230	631	4,185	174					17,415	805
1909.....	30,710	1,523	3,537	148					34,247	1,671
1910.....	111,645	5,505								

<sup>a</sup> After 1909 all imports of salmon, pickled or salted, are included under "All other cured or preserved."

<sup>b</sup> Includes 157 pounds, valued at \$6, from China.



FIG. 1.—UNITED STATES SALMON HATCHERY, YES BAY, ALASKA.



FIG. 2.—UNITED STATES SALMON HATCHERY, AFOGNAK, ALASKA.



BONNEVILLE SALMON HATCHERY OF THE OREGON FISH AND GAME COMMISSION, SHOWING REARING PONDS.



### XIII. SALMON CULTURE.

The artificial culture of salmon on the Pacific coast has developed into a large and constantly expanding industry. The United States Bureau of Fisheries operates a number of large and well-equipped hatcheries, while the State governments of California, Oregon, and Washington, the Dominion of Canada, and the Province of British Columbia, and certain private companies have built and maintain a large number of hatcheries, some of these being among the largest in the world.

#### OBTAINING THE SPAWNING FISH.

The eggs used for artificial propagation are obtained from salmon taken on their way upstream to the natural spawning grounds. In order to arrest the ascent of the fish a rack is usually built across the stream. Where this is not feasible a trap is sometimes constructed for the purpose of catching the fish. Sometimes the racks have slat traps attached in which some fish are caught.

A number of methods have been employed for taking the fish as they are grouped below the rack and seeking for an opening, but the most practicable has been found to be by means of drag or haul seines swept across the area just below the rack. When the pocket or bunt is brought close to shore the workmen pick out the ripe fish and turn the others back to remain until they reach this stage. The ripe fish are placed in pens or live boxes made for this purpose, the males and females being kept separate. These live boxes are usually on the under side of a floating platform, and are accessible through hinged covers set in the plank flooring. Projecting beyond this platform is usually another, upon which the actual work of stripping the fish and caring for the pans is performed.

At a few places where the fish are caught before they have reached the ripe stage, notably Karluk, the fish are placed in a pound or corral and held until they become ripe. This method is resorted to only in case of necessity.

The surest sign of ripeness in a female is the separation of the eggs in the ovaries, but the experienced spawn taker can, from the general appearance of the fish, usually tell whether she is ripe or not, according to Bower.<sup>a</sup>

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<sup>a</sup> Fish culture in Alaska. By Ward T. Bower. Alaska fisheries and fur industries, 1911. United States Bureau of Fisheries, document no. 766, p. 70.

An interesting experiment was conducted at the Afognak station last season [1910] to determine the degree of ripeness producing the best quality of eggs. The loss on the lot taken from females which were dead ripe—eggs flowing very freely—was less than 1 per cent, while with another lot, where the females were ordinarily ripe upon testing in the usual manner, the loss was about 5 per cent. This shows the need of caution in having fish fully ripe before stripping if the highest degree of efficiency is to be expected.

### TAKING THE EGGS.

As the eggs of the females confined in pens are likely to be injured within the fish, stripping is usually done every day.

When ready for spawn taking one man lifts a female from the live box by means of a small dip net, while another man lifts out a male in the same manner. They are held suspended in the net until their violent struggles are over, when it is easy to handle them.

For many years, and even yet at many hatcheries, the method of taking salmon spawn has been by pressing the eggs out by steady downward pressure on the belly of the fish. The milt from the male is obtained in the same way.

Where the force is large and the fish rather small the quickest way is for one to hold the fish in one hand and press out the eggs or milt with the other. When the fish are large, or the working force is small, a strait-jacket is used. This is a sort of trough made about the average length of the salmon and hollowed out to fit its general shape. A permanent cleat is set across the lower end, while at the upper end is a strip with a buckle. The fish is slid into the trough, the tail going below the cleat, where it is securely held, and the head buckled in at the upper end with the strap. In this condition the fish is unable to do any harm by its struggles and the eggs can be pressed out at leisure.

A more modern method in use at many hatcheries, which has been well described by Mr. Bower,<sup>a</sup> is as follows:

The long-followed process of taking Pacific salmon eggs by hand expression has been superseded in the last few years by the method of incision, a method discovered and developed by the late Cloudsley Rutter in connection with his study of the life history of the salmon of the Sacramento River. This consists simply of making a cut in the abdominal walls from the throat or near the pectoral fins to the vent, the fish just previously having been killed by a blow on the back of the head. When making the cut the knife is either shielded by a guard or is so held between the thumb and forefinger as to allow not more than half an inch of the blade to project, thus precluding the possibility of injuring any of the eggs. Immediately following the incision the eggs flow in a mass into the spawning pan beneath. The operator's fingers are inserted into the abdominal cavity gently to assist in removing any eggs that may be enfolded in the organs or that may merely adhere to the walls of the cavity. Fertilization is accomplished in the usual manner.

<sup>a</sup> Fish culture in Alaska. By Ward T. Bower. Alaska fisheries and fur industries, 1911. United States Bureau of Fisheries, document no. 766, p. 80, 81.



FIG. 1.—STRIPPING SALMON WITH AID OF STRAIT JACKET.



FIG. 2.—CHEHALIS HATCHERY, WASHINGTON FISH AND GAME COMMISSION, SHOWING RACKS TO PREVENT SALMON FROM GOING UPSTREAM AND PEN FOR HOLDING SPAWNING FISH.

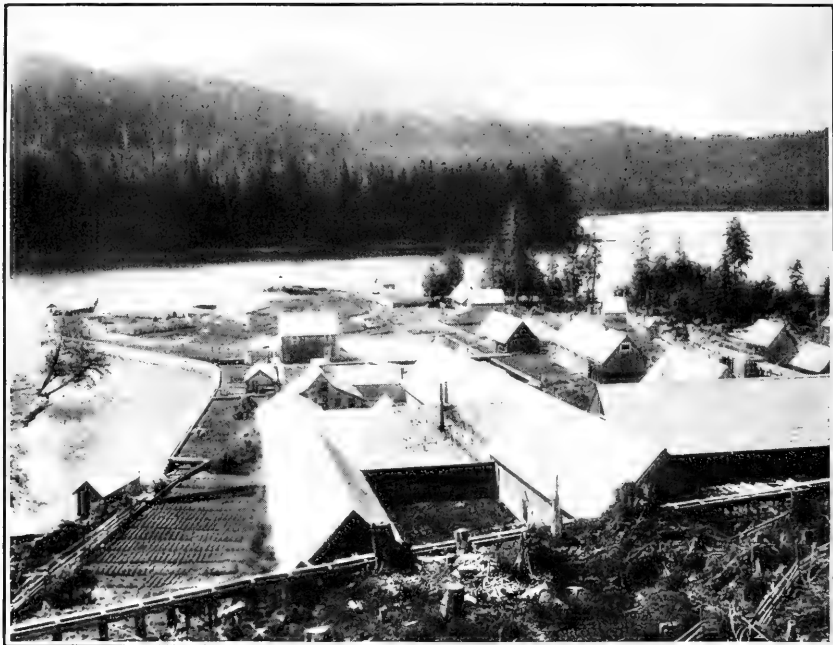


FIG. 1.—FORTMANN HATCHERY, NAHA STREAM, ALASKA, THE LARGEST HATCHERY IN THE WORLD.



FIG. 2.—CHEHALIS HATCHERY, WASHINGTON FISH AND GAME COMMISSION, SATSOP, WASH.

Care must be exercised not to tear loose from the ovaries any eggs that do not come freely when the organs are moved from side to side by the fingers. Eggs thus torn loose are immature, and if taken it becomes necessary to eliminate them subsequently in the hatchery. It is preferable also to have the fish either in a vertical position or with the head considerably higher than the tail, that gravity may assist the flow of eggs.

It was at first thought necessary—and the practice still obtains at some stations—to bleed the fish either by cutting off the head or tail before making the incision. Experimentation, however, has conclusively demonstrated that no advantage results from this procedure, as the few drops of blood that may occasionally fall into a pan of eggs result in no harm. The extra labor involved in bleeding may therefore be dispensed with entirely.

When taken by the method of incision the eggs are of greatly improved quality; there is no straining or rupture of good eggs as is inevitably the result when heavy hand pressure is exerted; no unripe eggs are torn from the ovaries; and at the same time there is no waste of good eggs left enfolded in the organs, as is certain to be the case in stripping by hand. The improvement in quality is from 5 to 10 per cent and the saving in labor, too, is of noteworthy consideration.

The taking of Pacific salmon eggs by incision marks so distinct an advance in fish culture that it is no longer permissible to continue the obsolete method of stripping by hand.

#### FERTILIZING THE EGGS.<sup>a</sup>

In impregnating the eggs the main object is to bring the milt and the eggs together as quickly as possible after they have left the fish. By some persons a little water is considered desirable to give greater activity to the milt, but if left more than a minute in the water there is a decided loss of fertilizing power. The eggs do not suffer so quickly from immersion in water. The absorbing property which they possess when they first leave the parent fish, and which attracts to the micropyle the spermatozoa, lasts several minutes, but it is not prudent to leave the eggs in the water a moment longer than is necessary before adding the milt.

The addition of the water is not essential to a good impregnation; in some instances better results are secured without the use of water and, after all, if the main object is secured, of bringing the milt and the eggs together with the slightest possible delay after they leave the fish, it makes very little difference whether water is used or not. The milt retains its fertilizing power several days when kept from air and water, and impregnation can be effected between fishes widely separated by merely forwarding the milt properly sealed. At Baird impregnation by the dry method, which has always been followed there, has resulted in the fertilization of about 90 per cent of the eggs so treated.

The Russian or dry method of impregnating eggs consists simply in taking both the eggs and the milt in a moist pan. It may be urged as an objection to this method that the eggs will be injured by striking against the pan, but it is a fact that although the same eggs would be destroyed by the concussion a week later, or even 24 hours later, they do not suffer in the least from it at the moment of extrusion from the fish.

It was at one time considered an important question whether the eggs or milt should be taken first, but with the dry method it makes no difference, as, either way, both eggs and milt remain operative long enough for all practical purposes of impregnation.

Various methods of treating the eggs in the pan after impregnation has taken place have been tried. Some operators leave the eggs in the pans as first taken with the milt for two or three minutes and then add water, after which they are left to stand in the pan until they separate, when they are washed clean, taken to the hatching

<sup>a</sup> A manual of fish culture, based on the methods of the United States Commission of Fish and Fisheries, revised edition, p. 10-12.

house, and placed in the troughs. Others pour the contents of the several pans—eggs, milt, and all—into a large can after the eggs become impregnated, and when the eggs separate the contents of the can are poured into the hatching troughs, trusting to the current in the troughs to wash the milt from the eggs. At Baird, water is poured on the eggs a few moments after they become impregnated, after which they are left perfectly quiet until they separate, which, in water of the temperature of the McCloud River in September, 52° to 53°, takes about an hour. The pans, in the meanwhile, are put in a trough filled with river water to keep them from becoming too warm. After the eggs separate they are carefully washed and are carried in buckets to the hatching house, where they are measured and placed in the hatching trays.

Mr. Bower<sup>a</sup> has the following to say as to the loss by concussion and the proper method of preventing same:

Coincident with the absorptive period in salmon eggs is an adhesive stage varying with the temperature from one to two hours, when the eggs are exceedingly sensitive. This is the so-called period of water hardening. Under no circumstances should the eggs be handled during this stage, nor should they be subjected to the slightest concussion. Repeated tests have demonstrated conclusively that even allowing the buckets containing the eggs to stand on the same platform where spawning operations are being carried on results in considerable loss.

To guard against this, the buckets should either stand on the bottom of the stream or else on a platform in every way independent of and having absolutely no connection with the main platform. To some this may seem like a small and irrelevant consideration, but strict observance is certain to reduce the loss by at least 2 or 3 per cent. During the process of water hardening the buckets should be partly submerged to properly regulate the temperature.

Due caution must be observed not to move the eggs until water hardening is complete. After a little experience the operator can readily tell, upon carefully inserting the hand and finding the eggs free and hard and no longer soft and velvety, even toward the bottom of the bucket, that they may be moved to the hatchery without fear of loss.

#### HATCHING APPARATUS AND METHODS.<sup>b</sup>

The hatching apparatus generally employed on this coast is pretty much of the same pattern and is described as follows:<sup>c</sup>

The hatching apparatus generally employed on the Pacific coast in salmon propagation consists of a combination of troughs and baskets. The troughs in common use are the so-called "Williamson troughs," which are 16 feet long, 12, or 16 inches wide, and 6½ inches deep. The troughs are arranged in pairs, and usually two or three pairs are placed end to end on different levels. The fall of water in each trough is 1½ inches. The troughs are divided by double partitions of wood or metal into compartments just enough longer than the baskets to enable the latter to be raised and lowered and to be tilted slightly. The essential feature of these troughs is that at the lower end of each compartment a partition, extending entirely across the trough, reaches from the bottom almost to the top, and another similar partition at the upper end of the compartment reaches from the top almost to the bottom of the trough, each set of partitions being about an inch apart. The water is consequently forced to flow under the upper partition and over the lower partition, and to do this it must

<sup>a</sup> Fish culture in Alaska, by Ward T. Bower. Alaska Fisheries and Fur Industries, 1911. United States Bureau of Fisheries, document no. 766, p. 81, 82.

<sup>b</sup> At some of the Alaska hatcheries quite large baskets, some holding as many as 103,000 red-salmon eggs are used.

<sup>c</sup> Manual of fish culture, based on the methods of the United States Commission of Fish and Fisheries, revised edition, p. 12, 13.

necessarily ascend through the tray of eggs. The troughs are provided with canvas covers stretched upon light frames and made sunlight proof by saturation with asphaltum varnish, and their interiors are thickly coated with asphaltum.

The egg receptacles are wire trays or baskets about 12 inches wide, 24 inches long, and deep enough to project an inch or two above the water, which is 5 or 6 inches deep in the troughs in which they are placed. Into each of these baskets 2 gallons of salmon eggs, equivalent to about 30,000, are poured at a time. The eggs suffer no injury whatever from being packed together in this manner, the water being supplied in a way that forces it through the eggs, partially supporting and circulating through them. The meshes are too small to permit the eggs to pass through, although the fry are able to do so.

The advantages of this apparatus and method are:

(1) The top of the tray or basket is out of the water and always entirely dry; consequently, in handling it, the hands are kept dry.

(2) By tilting one end of the tray up and down a little or by lifting it entirely and settling it gently back again in its place the bad eggs will be forced to the top; thus a feather is not required in picking over the eggs and the injuries very often inflicted with it are avoided.

(3) The top of the tray being above water, the eggs can never run over the top nor escape in any way, which is a great advantage over the shallow form of tray.

(4) There is economy of space; 30,000 to 40,000 eggs can be placed in each basket, provided a sufficient quantity of water is available. Two troughs 16 feet long and 1 foot wide will by this method carry about 500,000 salmon eggs. The deep trays may be filled at least half full of eggs, and thus 10 times as many eggs can be hatched in the same space and with the same supply of water as by the old method. A good but gentle circulation is continually maintained through the eggs.

(5) The deep-tray system is admirably adapted to getting rid of mud that has collected on the eggs, for all sediment accumulating about them can be easily removed by gently moving the tray up and down a few times in the water; but if the deposit of mud on the troughs becomes so excessive as to be unmanageable, a false bottom of wire cloth or perforated zinc can be placed in the troughs at a suitable distance above their real bottom, leaving a space of about 1 or 1½ inches between the wire cloth and the trough bottom. By this means the mud that comes into the trough will sift down into the space below the wire cloth entirely out of the way of the fish, the movements of the fish themselves helping very much to produce this result. Should the accumulation of mud in the space below the false bottom of the trough become too great, it can easily be sluiced out in various ways.

When quinnat salmon eggs are simply to be matured for shipment, hatching trays with one-fourth or one-fifth inch square mesh will answer the purpose, but when the eggs are to be hatched in them, every alternate strand of wire running lengthwise, or, better still, every second and third thread, should be left out in order to form an oblong mesh through which the newly-hatched fry, after separating themselves from the unhatched eggs, can escape from the hatching trays into the trough below.

At Baird eggs kept in water averaging about 54° F. hatch in 35 days. The allowance of 5 days' difference in the time of hatching for each degree of change in the water temperature is approximately correct.

For the first few days the eggs of the quinnat salmon are very hardy, and at this time they should be thoroughly picked over and the dead ones removed as far as possible before the delicate stage during the formation of the spinal column comes on, so that during that critical period they may be left in perfect quiet. As soon as the spinal column and the head show plainly, the eggs are hardy enough to ship, but when there is time enough it is better to wait a day or two until the eye-spot is distinctly visible, after which time the eggs will stand handling and may be safely shipped if properly packed.

### HANDLING EGGS IN HATCHERY.<sup>a</sup>

At some of the Bureau's stations where salmon eggs are handled it was the custom until a few years ago to "bury" the eggs or leave them undisturbed (aside from picking once the day after spawning) for two or three weeks after putting them in the baskets. The result was that they were in some instances literally buried under and in such a mass of mud and sediment that many eggs were killed. Discontinuance of the practice resulted in a very appreciable improvement.

When the water is so turbid as to cause a heavy deposit of sediment, it is better to go over the eggs occasionally, even through the critical stages of development, or until the line of the fish is well formed. Of course the eggs must be handled with utmost caution at all times, but owing to their extreme sensitiveness during the two or three days following the closing of the blastopore and until a perceptible curve shows in the tail, they should be left entirely untouched. It soon becomes easy to determine the stage of an egg's development by holding it up to the light between the thumb and forefinger. In the absence of cautious and skilled operatives and unless the water is roily for an extended period, it is undoubtedly better to let the eggs remain undisturbed until the curvature of the tail is visible to the unaided eye. The accumulation of a moderate coating of sediment which readily washes off is not injurious. In a few instances it has become necessary to handle the eggs during the tender stage to arrest the spread of fungus, but where the water supply is reasonably well adapted to fish-cultural purposes such a course is rarely if ever necessary.

### REMOVAL OF DEAD EGGS BY THE USE OF SALT SOLUTION.

Among the most noteworthy advances in fish-cultural methods during the last few years has been the use of salt as an aid in the removal of dead eggs. The development of this process has extended over a period of several years, but it is more during the last year or so through the efforts of L. E. Baldrige, of the Yes Bay station, that it has reached a high degree of efficiency.

Compared with the time-honored process of picking by hand, there are marked advantages in using the salt solution, and chief among these is the great saving of labor. It is estimated that if the eggs happen to be of not more than mediocre quality it would take at least 20 pickers to remove as many dead eggs as could 2 men using the salt solution. Moreover, the operation is much more thoroughly performed in the latter process than is possible in picking by hand.

Another advantage of using the solution is that it is possible thoroughly to clean the eggs. This greatly reduces any loss through contamination and infection resulting from the decomposition and fungous growths which inevitably follow the long-continued presence of dead eggs that in the hand-picking method frequently escape attention. Even when utmost care is taken to pick out all dead eggs, fungoused masses will occasionally appear. This condition is rarely observed when the salt solution has been used, and it undoubtedly means that in the aggregate many eggs are saved. Still another point in favor of the solution, it is generally believed, is that it acts as a tonic or stimulant to the good eggs while at the same time as a deterrent to the growth of fungus. Again, in picking by hand there is apt to be loss by movement of the eggs during delicate stages of development; and the oft-repeated insertion of egg tweezers, which are bound to touch other eggs, undoubtedly at times results in injury.

Recent experience has demonstrated that the solution may be applied effectively to eggs freshly taken as well as those in more advanced stages of development.

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<sup>a</sup> Fish culture in Alaska. By Ward T. Bower. Alaskan fisheries and fur industries, 1911. United States Bureau of Fisheries, document no. 766, p. 81, 82.



The principle of the salt bath is simply that the specific gravity of the good eggs is greater than that of the bad eggs, hence upon being placed in the salt solution the good eggs sink and the bad remain afloat and are easily removed. It is vitally essential to the success of the undertaking that the solution be of the proper strength, and it is for this reason that the beginner is apt to become discouraged. If the solution is too weak all the eggs, both good and bad, will sink, while if it is too strong all will remain afloat. The margin of the proper density is so narrow that in the operation it is necessary every few minutes to strengthen the solution by adding more salt or brine, otherwise the small amount of fresh water which adheres to a basket of eggs as it is lifted from the hatching trough into the solution will affect unfavorably the results when treating succeeding baskets. Experience and careful observation, however, will soon make it possible for the operator accurately to judge when to add a bit of the stock solution. It is a convenience, of course, to have a salinometer at hand when preparing the solution. It is commonly the practice as an aid in preparing the solution to test it occasionally with a few eggs.

Highly successful results in using the solution with red salmon eggs have been attained at the Yes Bay station, and a detailed description is accordingly given of the methods pursued at that place.

The chief item of equipment consists of a water-tight wooden tank 4 feet long, 2½ feet wide, and 10 inches deep for holding the solution in which the eggs are immersed. Before each basket is immersed it is necessary that the surface of the solution be perfectly quiet, for any ripple or current will tend to disturb the buoyant effect of the solution upon the eggs. Therefore it was found of great convenience last winter to use a floating frame made of half-inch material 6 inches wide fastened together vertically and at right angles, thus forming open squares about 6 inches either way. After each basket of eggs is lifted from the salt bath this frame is placed in the solution to stop all motion of the water, being pushed down until it is almost submerged and held firmly against the side of the tank for a few seconds. Upon being carefully withdrawn the solution is quiet and the next basket of eggs may be immersed without further delay.

Another piece of equipment is a feather fan with which gently to push the floating dead eggs away from over the submerged basket into which the good eggs have settled. Unless the dead eggs are quickly moved they too will sink. A feather fan made by fastening eagle feathers to a thin strip 8 inches long by 1½ inches wide works much more satisfactorily for this purpose than a wing. An ordinary hand scaff net about 12 by 14 inches in size for removing dead eggs from the tank, a dipper, and a bucket complete the outfit. Wood and metal surfaces in all equipment should be well coated with asphaltum or some similar preparation.

At Yes Bay as soon as five or ten million eggs are far enough advanced to stand light concussion the baskets are lifted out of the troughs and the eggs are stirred thoroughly with the hand, which causes practically all of the unfertile or empty eggs to turn white. As soon as the line of the fish shows plainly when held up to the light and there is a distinct curvature to the tail, the eggs are sufficiently well advanced in development to stand stirring. After this process the baskets are returned to the troughs and allowed to remain three days, for when first turned the unfertile eggs are about as heavy as the good eggs and consequently would sink if the salt solution were applied at once.

On the fourth day after stirring, everything being in readiness, five or six baskets are removed from a trough and set on top to drain. After a few moments a basket is grasped at each end and is lowered into the tank containing the solution until the liquid comes through the eggs. A light shake is then given to level up the eggs in the basket. Next, slowly and very gently, the basket is lowered until the brine comes almost to its rim and is held perfectly still for a moment. All the eggs in the basket will rise, but soon the good eggs will begin to sink, and presently, if it is a basket of poor eggs, the surface

will be completely covered with bad eggs. Now, without the slightest jar, the basket is lowered far enough below the surface to permit an egg to float over the rim. The bad eggs will immediately start toward the edges of the tank. After a few seconds the basket is gently lowered until it rests upon the bottom. The remaining dead eggs are then brushed away from over the basket by means of quick, short, and light strokes of the feather fan; long, sweeping strokes are to be carefully avoided. One end of the basket is then gently raised until it is above the surface of the brine and the basket is drawn toward the end of the tank and out from under the floating dead eggs. At the same time the fan is used with the other hand to aid in moving any of these floating eggs to one side. The fan is then dropped and the lower end of the basket is grasped and the whole is quickly raised out of the solution. The basket is set at an angle on the tank for a moment to drain and is then carried to the hatching trough. The attendant lifts out another basket to drain along with the four or five others originally removed and returns to the tank of brine with the basket that has been draining the longest.

While this is being done the other operator skims the dead eggs off the surface of the brine and places the frame described above in the tank for a moment to stop all motion of the solution. After five or six baskets have been treated, any eggs that have settled to the bottom of the tank are removed, as they absorb and weaken the brine. It is necessary, as earlier mentioned, to add a little fresh brine after handling each basket. The eggs should be as clean as possible, as the solution will not be effective when it contains much sediment. A 1-inch hole with plug in one corner of the tank is convenient for drawing off any deposit of this character. Should failure occur in treating a basket of eggs, as, for example, if by sudden jar they are all caused to sink, or if the brine is too weak or too strong, the basket must be put back in the hatching trough, as it will not respond to treatment again the same day.

At Yes Bay last winter a large portion of the 72,000,000 eggs were thoroughly cleaned up at one handling. Two men ran as many as 10,000,000 eggs through the salt bath in a single day. It is customary on the day after treating the eggs to have them gone over so that if any dead eggs remain they may be picked out by hand. This, however, requires very little time, as but few dead eggs are found. No alarm need be felt if the eggs seem to shrink as a result of the immersion, for they will soon resume their normal size upon being replaced in fresh water.

The use of the salt solution has been extended lately to the handling of lake trout eggs in Michigan and Minnesota, and there appears to be no reason why it is not equally well adapted to the eggs of other salmonoids. Certainly its many advantages commend further experimentation in this direction.

The eggs of the salmon hatch very gradually at first, only a small proportion coming out the first day, but the number increases daily until the climax is reached, when large numbers of young burst their shells in a single day. As at this time the vast number of discarded shells are apt to clog up the guard screens at the outlets of the troughs, great care and vigilance is necessary to prevent this by thoroughly cleansing them frequently.

The hatched fish easily slip through the oblong mesh in the bottom of the trays into the space below. They should be assisted in doing this by gently raising and lowering the tray at intervals, care being taken not to raise them out of the water.

After they are all hatched out and in the bottom of the troughs, about the only danger to guard against is that of suffocation. They

frequently crowd together in heaps and dig down under one another until some of them die for want of running water, which is less than an inch away from them. The best remedy in such a case is to thin them out.

John Pease Babcock, Assistant to the Commissioner of Fisheries of the Province of British Columbia, in 1910 advanced a novel suggestion that freshly fertilized eggs buried under sand and gravel immediately after would produce strong healthy fry at less cost than under existing hatching methods, and that fry so produced are stronger and more capable of resisting the attacks of their active enemies.

The short, but interesting, account of his experiments is reproduced entire.

In writing of the propagation of salmon and trout, some authorities state that considerable loss is occasioned in natural propagation by many of the eggs becoming embedded in sand and gravel; that all the eggs so embedded are lost.

Observation and experiment in the propagation of Pacific salmon and trout for a considerable period lead me to advance the theory that in natural propagation only those eggs which become embedded beneath several inches of sand and gravel produce alevins which live to attain the fry stage; and that those eggs which are not covered by several inches of sand and gravel are either consumed by active aquatic enemies or destroyed by vegetable molds, commonly termed "fungus."

My experiments have demonstrated that the burial of freshly fertilized eggs of the *nerka* and other Pacific salmon does not smother them; that eggs so treated not only live but hatch; and that if they are covered to a sufficient depth the alevins produced survive and possess the instinct and power to work their way gradually to the surface; that if buried beneath 5 or 6 inches of sand and gravel such eggs will hatch, and the young will work their way up through the sand and gravel to the surface, and that by the time they emerge, have absorbed their sacs and are then exempt from the attacks of vegetable molds.

Eggs buried under 1 or 2 inches of sand and gravel produce alevins that work their way up to the surface before the sac is absorbed, and upon reaching the surface are subject to attack by vegetable molds, and a very large percentage are thus destroyed, as well as by the more developed forms of aquatic life.

Eggs buried to a depth of 3 inches produce alevins that work their way to the surface so gradually that by the time they reach the surface their sacs are so nearly absorbed that many, but not all, resist the effects of fungus. Alevins from eggs buried beneath less than 4 inches of sand are liable to reach the surface while the sac is so thinly covered that few, if any, survive the effects of fungous growth.

The spawning beds of Pacific coast streams from California to Alaska (to which my observations have been confined), where the salmon spawn in numbers are, during and after the spawning period, covered with more or less vegetable molds. These molds are particularly common in the beds of streams where great numbers of salmon have spawned and died. Every experienced fish culturist knows that most waters carry great numbers of spores of fungi, and how difficult it is to prevent eggs and alevins from being attacked and injured by their growth. I believe that in natural propagation fungous growths destroy more salmon eggs and alevins than all other causes combined. The vegetable molds of Pacific streams are not active beneath the surface of the beds of streams. Salmon eggs cast therein, if even thinly covered with sand, are not injured by them. These molds do not affect the fry that have nearly or entirely absorbed their sacs, but they are deadly if permitted to attach themselves to either the eggs or the alevins.

My experiments along this line lead me to express the opinion that by the burial of freshly fertilized salmon eggs under 6 or 7 inches of sand and gravel strong healthy fry can be produced at less cost than under existing hatching methods, and that fry so produced are stronger and more capable of resisting the attacks of their active enemies.

I trust that this short statement of my experiments in the burial of salmon eggs may be deemed of sufficient economic importance to stimulate fish culturists generally in experimenting along similar lines. Those who do will perhaps experience some difficulty at first in the covering of a large number of eggs. Experimenters will find that after preparing suitable beds of sand and small gravel the eggs can be evenly laid and held until covered, if the surface of the bed is first thickly indented with cells a little deeper than the eggs. This can be readily accomplished by stamping the bed with a board covered with projections or pegs of suitable size.

My experiments suggest that in the near future most of the buildings and hatching apparatus now used in the propagation of salmon and trout will be dispensed with; that after the eggs have been expressed and fertilized, instead of being placed in wire baskets in hatcheries, they will be buried beneath the sand and gravel of the beds of natural or prepared streams, and that with the exception of watchmen to protect them, little or no other labor will be required.<sup>a</sup>

### FEEDING AND PLANTING THE FRY.

For some time the fry remain at the bottom of the trough, but when the yolk sac is nearly absorbed they rise from the bottom and begin swimming. As a rule the fry are planted about the time the yolk sac is absorbed, thus obviating the necessity for feeding them. Some experts advise planting young red salmon when the umbilical sac is about two-thirds absorbed, which is the time when the fish begin to swim up freely. With the temperatures prevailing at the Alaska hatcheries, this means that the fry must be held at least four or five weeks after hatching.

### PACKING EGGS FOR SHIPMENT.

In packing salmon eggs for shipment it is the custom at the Bureau of Fisheries's hatcheries to use a packing box made of one-half inch pine, 2 feet square and 1 foot deep.<sup>b</sup>

At the bottom is placed a thick layer of moss, then a layer of mosquito netting, then a layer of eggs, then mosquito netting again, then successive layers of moss, netting, eggs, netting, and so on to the middle of the box. Here a firm wooden partition is fastened in and the packing renewed above in the same manner as below. The cover is then laid on the top, and when two boxes are ready they are placed in a wooden crate, made large enough to allow a space of 3 inches on all sides of the boxes. This space is filled with hay to protect the eggs against changes of temperature, and, the cover being put on the eggs, they are ready to ship. In the middle of the crate an open space about 4 inches in depth is left, between the two boxes of eggs, for ice. As soon as the crates arrive at the railway station this space, as well as the top of the crate, is filled in with ice. Recent experiments show that salmon eggs can be packed and safely transported to considerable distances when they are first taken.

<sup>a</sup> Some experiments in the burial of salmon eggs—suggesting a new method of hatching salmon and trout. By John Pease Babcock. *Trans. Am. Fish. Soc.*, 1910, p. 393-395. Washington, 1911.

<sup>b</sup> A manual of fish culture, based on the methods of the United States Commission of Fish and Fisheries. Revised edition, p. 14.

## REARING SALMON FRY.

For many years it was the custom to plant the fry as soon as they had absorbed the yolk sac, a period of about 30 days. A few thousands were sometimes raised to the fingerling, yearling, or adult stage, more as a curiosity than anything else. No particular difficulty was experienced in raising these fish, but the expense entailed in feeding them for a prolonged period, and the impossibility of doing so unless large ponds were constructed at great expense for the purpose of holding them during the feeding period, prevented the general adoption of the rearing system.

For some years certain fish culturists had contended that the planting of fry just after they had absorbed the umbilical sac was an economic mistake, claiming that at this age they were weak and comparatively sluggish in their movements, and would fall easy prey to their numerous fish, bird, and other enemies. The late Robert D. Hume, who built and operated a hatchery on the lower Rogue River; also one on the upper Rogue River, which the United States Bureau of Fisheries operated for some years, was one of the first to take up the rearing of salmon fry on any scale.

In time these objections bore weight, and a few years ago the construction of ponds in which fry could be held and fed until they had reached a size which would insure them at least an even chance for their lives was undertaken all along the coast except in British Columbia, with the result that to-day there is pond capacity for about one-half of the total capacity of the various hatcheries.

Most of the nursery ponds have been constructed near the hatcheries and usually comprise oblong trenches dug in the earth and walled with cement and stone.

In Oregon the State authorities found that the best results in pond rearing were obtained by using creek or natural ponds, which were made by placing dams across the small streams in the vicinity of the hatcheries. When first taken from the hatching troughs the fry are placed in the artificial ponds until the danger from spring freshets in the small streams is over, when the fry are transferred to the natural ponds, where the continual flow of fresh water, and the logs, rocks, etc., which provide shade and shelter, afford more natural conditions, and in which the natural food of the fry supplements the artificial food provided by man.

The young fry show when they are ready to feed by darting to one side or the other when small particles of food are dropped in the water and float past them. For the first few weeks they should be fed regularly and as often as six times a day, and the earlier in the day the feeding begins and the later it continues at night the better. Two hours after feeding they will be found to be ravenously hungry,

and as they grow much faster for frequent feeding great care should be taken to see that they are well fed. If not fed sufficiently they will bite at one another and cause more or less mortality among themselves.

A big advantage in connection with the use of natural ponds is the comparatively small expense involved in providing for them as compared with the large expense involved in the construction of cement ponds.

### FOOD.

In feeding salmon fry almost every conceivable food has been utilized. By universal consent liver is conceded to be the best food for the fry, as it can be ground finer than other foods and the blood which it contains is highly nutritious. At many places, however, it is impossible to secure liver, while its cost when available is generally prohibitive.

The food used is generally that most available and which experience has shown that the fry like and upon which they thrive.

In Oregon <sup>a</sup> it has been found that the extremely young fry thrived on a mixture of ground dried salmon and mush (composed of middlings and other wheat products). Milk curds from near-by creameries also proved satisfactory. The older fish are fed on ground smelt, lamprey eels, spent salmon, both dried and salted, and offal from the canneries, some loose and some packed in 1-gallon cans.

### SALMON HATCHERIES ON THE PACIFIC COAST.

Below is shown a list of the salmon and steelhead-trout hatcheries operated on the Pacific coast during the year 1915:

Hatcheries.	Collecting stations.	Hatcheries.	Collecting stations.
<b>U. S. BUREAU OF FISHERIES.</b>		<b>U. S. BUREAU OF FISHERIES—continued.</b>	
Alaska:		Washington:	
Afognak .....	{Eagle Lake. Uganik Lake. Ketchikan Creek.	Baker Lake .....	
Yes Bay .....		Birdsview .....	
California:		Darrington .....	
Baird .....		Day Creek .....	
Battle Creek .....		Duckabush .....	
Hornbrook .....		Illabott .....	
Mill Creek .....		Quilcene .....	
Oregon:		Sultan .....	
Clackamas .....	Eagle Creek.	Big White Salmon .....	
Applegate .....	Eagle and Tanner Creeks.	Little White Salmon .....	
Illinois River .....		<b>STATE OF CALIFORNIA.</b>	
Lower Rogue River .....		Sisson .....	
Rogue River .....		Brookdale .....	
Willamette River .....		Price Creek .....	
		Ukiah .....	Snow Mountain.

<sup>a</sup> Rearing and feeding salmon fry in Oregon. By R. E. Clanton. Trans. Pac. Fish. Soc., 1914, p. 91-94. Seattle, 1915.

Hatcheries.	Collecting stations.	Hatcheries.	Collecting stations.
<b>STATE OF OREGON.</b>		<b>STATE OF WASHINGTON—con.</b>	
Wallowa River.....	Upper Sandy River.	Wind River.....	
McKenzie River.....	Lower Sandy River.	Chehalis.....	
Salmon River.....		Humtulpis.....	
Bonneville.....		Willapa.....	
Santiam River (eyeing station).		Cold Creek (Clarke County).....	
Klaskanine.....		<b>DOMINION OF CANADA.</b>	
Willamette River (eyeing station).		Granite Creek.....	
Eagle Creek.....		Pemberton.....	
Snake River (Idaho).....		Harrison Lake.....	
Tillamook.....		Stuart Lake.....	
Yaquina.....		Skeena River.....	
Siuslaw.....		Babine Lake.....	
Umpqua.....		Rivers Inlet.....	
South Coos.....		Fraser River.....	
Coquille.....		Anderson Lake.....	
Alsea.....		Kennedy Lake.....	
Rogue River.....		Cowichan Lake.....	
<b>STATE OF WASHINGTON.</b>		<b>PROVINCE OF BRITISH COLUMBIA.</b>	
Dungeness.....		Seton Lake.....	
Elwha.....		<b>BRITISH COLUMBIA PACKERS ASSOCIATION.</b>	
Green River.....		Nimkish Lake.....	
Green River (eyeing station).		<b>ALASKA (PRIVATE HATCHERIES).</b>	
Nooksak.....		Alaska Packers Association:	
Nooksak River, north fork.....		Fortmann.....	
Nooksak River, south fork.....		Karluk.....	
Pilchuck.....		Northwestern Fisheries Co.: Quadra.	
Samish.....		Hetta.....	
Skagit River.....		North Pacific Trading & Packing Co.: Klawak.	
Skokomish.....			
Snohomish.....			
Startup.....			
Stillaguamish.....			
Chinook.....			
Kalama.....			
Lewis River.....			
Pateros-Methow.....			
Wenatchee.....			
Tilton River.....			

## GENERAL STATISTICS.

*Distribution of fry, etc.*—In the following table is shown by years and species the distribution in Pacific coast waters of fry, fingerlings, yearlings, and adults from 1873, when the first hatchery began operation, to 1915, inclusive. The figures on fingerlings, yearlings, and adults are not as complete as could be wished, this being due to certain of the State fish commissions not separating them from the fry in the published results.

The table shows the enormous total of 6,291,011,445 fry and 26,290,421 fingerlings, yearlings, and adults as having been deposited in local waters since the inception of the work on this coast. Of these nearly one-half were sockeye, or red salmon, followed by chinook, or spring, coho, or silver, chum, steelhead trout, and humpback salmon in the order named.

This table does not show the large number of eggs, fry, etc., shipped from the coast hatcheries to other sections of the country and to various foreign countries. These appear in the tables shown under the various States, Provinces, and Territories.

## DISTRIBUTION OF SALMON FRY, ETC., IN THE PACIFIC COASTAL STREAMS OF NORTH AMERICA, IN SPECIFIED YEARS.

Years.	Chinook, king, or spring.		Coho, or silver.		Chum, fry.	Humpback, or pink, fry.
	Fry.	Fingerlings, yearlings, and adults.	Fry.	Fingerlings, yearlings, and adults.		
1873.....	520,000					
1874.....	850,000					
1875.....	2,250,000					
1876.....	2,000,000					
1877.....	2,550,000					
1878.....	2,582,620					
1879.....	5,376,500					
1880.....	4,059,290					
1881.....	4,974,790					
1882.....	3,991,750					
1884.....	600,000					
1886.....	150,000					
1887.....	200,000					
1888.....	2,590,000					
1889.....	8,168,000					
1890.....	5,250,475					
1891.....	9,269,000					
1892.....	4,299,000	25,000				
1893.....	10,825,950					
1894.....	8,427,900		280,000			
1895.....	6,458,000		910,000	560,000		
1896.....	25,581,033	807,150				
1897.....	31,146,095		298,137			
1898.....	73,684,076					
1899.....	56,773,351		189,000			
1900.....	33,974,064		13,925,104		10,301,760	
1901.....	36,563,138	1,668	20,047,935		16,478,280	
1902.....	73,852,120		41,436,123		9,937,390	
1903.....	75,558,389		34,460,291		10,012,390	
1904.....	161,530,963		23,894,026			521,797
1905.....	143,714,117		30,743,492			
1906.....	167,745,494	122,980	47,356,449	300	3,268,800	969,990
1907.....	124,578,390		44,426,380		6,120,000	4,224,255
1908.....	135,447,179	2,165,797	54,108,557		4,342,350	31,920,662
1909.....	88,188,707	16,949	50,648,674		7,805,000	10,000
1910.....	97,361,532	225	45,863,952		8,607,500	2,251,340
1911.....	80,570,265	11,700	52,869,759		13,435,750	460,150
1912.....	101,810,515	1,405,860	66,087,446	116,300	4,684,950	34,205,460
1913.....	112,008,886		79,313,839		35,792,440	1,888
1914.....	133,271,477	2,571,711	67,682,576		16,623,984	39,685,814
1915.....	149,666,221	9,875,745	92,926,831		63,088,372	7,867,484
Total.....	1,988,419,287	17,004,785	767,468,571	676,600	210,498,966	122,118,840



## DISTRIBUTION OF SALMON FRY, ETC., IN THE PACIFIC COASTAL STREAMS OF NORTH AMERICA, IN SPECIFIED YEARS—Continued.

Years.	Sockeye, red, or blueback.		Steelhead trout.		Total.	
	Fry.	Fingerlings, yearlings, and adults.	Fry.	Fingerlings, yearlings, and adults.	Fry.	Fingerlings, yearlings, and adults.
1873.....					520,000	
1874.....					850,000	
1875.....					2,250,000	
1876.....					2,000,000	
1877.....					2,550,000	
1878.....					2,582,620	
1879.....					5,376,500	
1880.....					4,059,290	
1881.....					4,974,790	
1882.....					3,991,750	
1884.....					600,000	
1885.....	1,800,000				1,800,000	
1886.....	2,625,000				2,775,000	
1887.....	4,414,000				4,614,000	
1888.....	5,807,000				8,397,000	
1889.....	4,419,000				12,587,000	
1890.....	6,640,000				11,890,475	
1891.....	3,603,800				12,872,800	
1892.....	6,000,000				10,299,000	25,000
1893.....	6,274,000				17,099,950	
1894.....	8,504,000		353,500		17,565,400	
1895.....	11,681,000				19,049,000	560,000
1896.....	15,868,000		107,808		41,556,841	807,150
1897.....	18,374,440		262,000		50,080,672	
1898.....	20,916,000		650,000		95,250,076	
1899.....	15,761,000		8,625		72,731,976	
1900.....	29,590,000		2,061,560		89,852,488	
1901.....	19,901,253		1,709,326		94,699,932	1,668
1902.....	72,679,000		3,213,948		201,148,581	
1903.....	83,398,789		4,509,641	37,033	213,939,500	37,033
1904.....	70,710,200		4,207,920		260,864,906	
1905.....	119,963,200		3,805,675		298,226,484	
1906.....	232,037,442		6,725,965	21,383	458,104,140	147,663
1907.....	228,018,450		5,629,493		412,996,968	
1908.....	230,528,455		5,837,671		462,184,874	2,165,797
1909.....	239,251,146		8,193,778		394,097,305	16,949
1910.....	396,215,795		11,368,446		561,668,565	225
1911.....	257,463,497		14,995,717		419,795,138	11,700
1912.....	324,325,768		12,710,382	177,790	543,824,521	1,699,950
1913.....	242,146,069		16,654,906		485,918,028	
1914.....	261,365,781		11,719,558		530,349,190	2,571,711
1915.....	198,910,010	8,369,830	22,942,900		535,401,818	18,245,575
Total.....	3,145,192,093	8,369,830	137,698,819	239,206	6,371,396,578	26,290,421

*Output of Bureau of Fisheries hatcheries.*—The table below shows by years and species the combined output of the various hatcheries of the United States Bureau of Fisheries on this coast. The greater part of the egg output was to various State hatcheries on the Pacific coast, more particularly those belonging to the State of California. The total figures show that since the Bureau began operations on this coast it has distributed 966,240,303 eggs, 603,076,619 fry, and 31,176,283 fingerlings, yearlings, and adults.

OUTPUT OF PACIFIC COAST SALMON HATCHERIES OWNED BY THE UNITED STATES  
BUREAU OF FISHERIES, 1872 TO 1915.

Year ending June 30—	Chinook, king, or spring.			Coho, or silver.		
	Eggs.	Fry.	Finger- lings, yearlings, and adults.	Eggs.	Fry.	Finger- lings, yearlings, and adults.
1872.....	30,000					
1873.....	1,400,000					
1874.....	4,155,000		850,000			
1875.....	6,250,000	1,750,000				
1876.....	5,065,000	1,500,000				
1877.....	4,983,000	2,000,000				
1878.....	7,810,000	2,500,000				
1879.....	4,250,000	2,300,000				
1880.....	3,800,000	2,000,000				
1881.....	4,300,000	3,100,000				
1882.....		3,991,750				
1883.....		776,125				
1889 <sup>a</sup> .....	3,450,000	6,000,000				
1890.....	2,554,000	2,860,475				
1891.....	3,688,000	5,678,525				
1892.....	2,902,000	1,647,900				
1893.....	3,530,000	5,290,100				
1894.....	7,500,000	651,500			280,000	
1895.....	3,699,000	500,000			690,000	560,000
1896.....	2,798,500	3,547,850	557,150			
1897.....	18,232,590	9,828,095			298,137	
1898.....	30,605,000	39,950,698				
1899.....	32,618,000	9,366,366				
1900.....	7,411,000	14,287,264			146,824	
1901.....	11,615,036	7,987,107	1,668		302,041	
1902.....	19,446,410	29,340,308			424,530	
1903.....	16,160,177	23,845,956	250	680,800	81,812	
1904.....	75,217,354	35,006,988			3,984,645	
1905.....	96,055,765	21,620,292		107,000	9,321,513	
1906.....	115,648,145	20,797,543	123,118	239,180	6,445,574	300
1907.....	78,587,705	17,567,092		760,000	3,636,952	
1908.....	68,520,550	24,998,185	2,165,797	296,000	13,420,714	57,932
1909.....	38,859,265	20,177,286	16,949	272,000	9,470,925	
1910.....	38,306,709	15,682,064	225	275,000	10,888,025	
1911.....	37,314,514	16,659,684	211,700	2,391,900	6,210,296	
1912.....	36,837,550	31,040,893	1,405,860	52,000	12,955,824	
1913.....	58,296,873	33,419,423		202,000	13,952,963	
1914.....	31,032,645	48,895,607	3,582,796	95,840	24,619,456	27,258
1915.....	25,751,005	53,612,056	9,604,985	111,200	24,018,355	267,662
Total.....	908,680,793	521,027,132	19,670,498	5,482,920	141,148,586	913,152

Year ending June 30—	Chum, fry.	Humpback, or pink.		Sockeye, red, or blueback.		
		Eggs.	Fry.	Eggs.	Fry.	Finger- lings, yearlings, and adults.
1900.....					10,683,000	
1901.....					3,834,453	
1902.....					3,371,000	
1903.....					3,731,789	
1904.....			176,597		3,855,000	
1905.....					7,819,281	10,000
1906.....		2,000	969,990	880,000	9,923,680	9,500
1907.....					58,835,055	
1908.....		502,000	6,764,762	75,000	69,883,305	
1909.....			10,000	100,000	93,408,496	
1910.....			1,731,740		146,081,595	
1911.....	911,650	100,000	460,150		100,490,900	
1912.....	2,495,000	3,271,740	2,566,325	2,000,000	91,422,273	
1913.....	19,479,000		1,880	2,000,000	78,724,900	
1914.....	8,672,735	13,260,000	637,652,777	6,020,000	53,071,574	120,000
1915.....	35,504,707	14,500,000	7,272,980	155,000	46,282,691	8,416,405
Total.....	67,063,092	31,635,740	57,607,201	11,230,000	781,418,992	8,555,905

<sup>a</sup> Operations suspended from 1884 to 1888, both inclusive.

<sup>b</sup> Includes 4,355 fingerlings, adults, and yearlings.

<sup>c</sup> Includes 119,480 fingerlings, adults, and yearlings.

**OUTPUT OF PACIFIC COAST SALMON HATCHERIES OWNED BY THE UNITED STATES  
BUREAU OF FISHERIES, 1872 TO 1915—Continued.**

Year ending June 30—	Steelhead trout.			Total.		
	Eggs.	Fry.	Finger- lings, yearlings, and adults.	Eggs.	Fry.	Finger- lings, yearlings, and adults.
1872.....				30,000		
1873.....				1,400,000		
1874.....				4,155,000	850,000	
1875.....				6,250,000	1,750,000	
1876.....				5,065,000	1,500,000	
1877.....				4,983,000	2,000,000	
1878.....				7,810,000	2,500,000	
1879.....				4,250,000	2,300,000	
1880.....				3,800,000	2,000,000	
1881.....				4,300,000	3,100,000	
1882.....					3,991,750	
1883.....					776,125	
1889 <sup>a</sup> .....				3,450,000	6,000,000	
1890.....				2,554,000	2,860,475	
1891.....				3,688,000	5,678,525	
1892.....				2,902,000	1,647,900	
1893.....				3,530,000	5,290,100	
1894.....	75,000	308,500		7,575,000	1,240,000	
1895.....		852,500	332,000	3,699,000	2,042,500	892,000
1896.....	175,000	107,808		2,973,500	3,655,658	557,150
1897.....	50,000	257,000		18,282,590	10,383,232	
1898.....	60,000	650,000		30,665,000	40,600,698	
1899.....	159,000	12,125		32,777,000	9,378,491	
1900.....	415,000	125,000		7,826,000	25,242,088	
1901.....	246,000	65,850	25,000	11,861,036	12,189,451	26,668
1902.....	481,000	130,250		19,927,410	33,266,088	
1903.....	480,000	702,700	285,848	17,320,977	28,362,257	286,098
1904.....	225,000	93,205	11,090	75,442,354	43,116,435	11,090
1905.....	464,400	537,205		96,627,165	39,298,291	10,000
1906.....	358,000	1,834,485	40,383	117,127,325	39,971,272	173,301
1907.....	250,000	1,190,305		79,597,705	81,229,404	
1908.....	487,725	1,089,596		69,881,275	116,156,562	2,223,729
1909.....	483,725	1,670,371		39,714,990	124,737,078	16,949
1910.....	300,000	3,511,226		38,881,709	177,894,650	225
1911.....	660,000	3,826,439		40,466,414	128,559,119	211,700
1912.....	905,000	4,289,415	294,090	43,066,290	144,769,730	1,699,950
1913.....	1,330,000	4,272,225		61,828,873	149,850,391	
1914.....	729,000	4,022,438		51,137,485	176,934,587	5,730,054
1915.....	877,000	5,262,973	1,048,317	41,394,205	171,953,762	19,337,369
Total.....	9,210,850	34,811,616	2,036,728	966,240,303	603,076,619	31,176,283

<sup>a</sup> Operations suspended from 1884 to 1888, both inclusive.

**ACCLIMATIZING PACIFIC SALMON IN EASTERN WATERS.**

For many years efforts have been made by the United States Bureau of Fisheries and various State fish commissions to introduce Pacific coast salmon in eastern waters. In the early history of fish culture chinook fry were planted in almost every imaginable stream along the Atlantic seaboard, in various streams in the Mississippi Valley, and also in tributaries of the Great Lakes. In most cases, owing to the unsuitability of the water, the experiment was doomed to failure from the start. In the case of a few streams where results might have been obtained, the plantings were at long intervals and the fish were too small to protect themselves, while no effort was made by the State authorities to protect them.

The most successful results with plants of chinook salmon have been obtained in Lake Sunapee, N. H., where it is now a not uncommon thing for anglers to catch chinooks with rod and reel.

In 1912 about 10,000 chinook fingerlings from Columbia River eggs furnished by the United States Bureau of Fisheries were planted by the Massachusetts Fish Commission in Lake Quinsigamond, and during July, 1914, about 20 months after they were hatched, over 600 salmon, according to a member of the commission, were caught, ranging from  $1\frac{1}{2}$  to 5 pounds each.

The most successful effort in this line was initiated by the United States Bureau of Fisheries in the fall of 1913, when it transferred from its hatcheries on the Pacific coast to those in Maine 13,240,000 humpback-salmon eggs. These were followed by a second shipment of 7,022,000 eggs in the fall of 1914, and of a third shipment of about 7,000,000 eggs in the fall of 1915. These eggs were hatched out and the fry planted in various selected New England streams where the conditions seemed favorable.

Early in August, 1915, a female humpback salmon  $22\frac{1}{2}$  inches long and weighing 4 pounds, 3 ounces, was taken at the Bangor waterworks in the Penobscot River. Shortly after a male fish of about the same size was taken in this river at Orland dam. A little later agents of the Bureau captured 20 alive near Bangor, and about 3,000 eggs were obtained and fertilized.

In Dennys River, in Maine, during the period between August 15 and September 24, local fishermen caught a number.

## CALIFORNIA.

### HISTORY.

The first fish-cultural station on the Pacific coast was located on McCloud River, a stream of the Sierra Nevada Mountains emptying into Pit River, a tributary to the Sacramento, 323 miles nearly due north of San Francisco. The site on the west bank of the river, about 3 miles above the mouth, was chosen after investigation of a number of places on the Sacramento, by Livingston Stone, one of America's pioneer fish culturists, and the station was named Baird, in honor of the then Commissioner of Fisheries, Prof. Spencer F. Baird. Although the season had nearly passed when the station was sufficiently advanced to handle eggs, 50,000 eggs were secured, and while 20,000 were lost, owing to the excessive heat, the remaining 30,000 were shipped east, all of which were eventually lost but 7,000 fry, which were planted in the Susquehanna River, in Pennsylvania.

The main object of the hatchery the first few years was to secure eggs to ship to the East for the purpose of introducing Pacific salmon in the waters in that section. The Commission early made an agreement with the State of California, however, under which the latter

at first paid part of the expense, and the Commission hatched and planted a portion of the take in the McCloud River. Later, part of the eggs were turned over to the State, which hatched and planted the salmon in local waters.

In 1881 the station buildings were washed away in a freshet, but were immediately rebuilt. From 1884 to 1887, both inclusive, all operations were suspended.

In 1889 a hatchery was established at Fort Gaston, on the Army reservation in the Hoopa Indian Reservation in Humboldt County, but it was not put into operation until 1890. As the reservation was abolished on July 1, 1892, the Commission took complete charge of the plant, and in 1893 established a tributary station on Redwood Creek. The same year Korbel station was established about one-half mile above Korbel, on Mad River, in Humboldt County. Owing to the lack of money this station was closed in the fiscal year 1896, but was reopened during the fiscal year 1897.

That same year the Commission erected, on ground owned by the State, a hatchery at Battle Creek in Tehama County and also took charge of and operated the hatchery erected at this place by the State fish commission the previous year. Under the terms of an agreement the Commission was to deliver to the State as many eyed spawn as the latter could hatch at Sisson, its own station.

Owing to their inaccessibility the Fort Gaston hatchery and its substations were abandoned in 1898. The same year an experimental station was established at Olema, Bear Valley, in Marin County, whence eggs were transferred from Baird station, hatched out here, and planted in Olema Creek in order to see if they could not be domesticated here, where they had not been found previously.

During the fiscal year 1902 a substation was established on Mill Creek, a stream which has its source in the foothills of the Sierra Mountains, in the northeastern part of Tehama County, and empties into the Sacramento River from the east about a mile above the town of Tehama. The eggs are retained here until eyed and then shipped to other hatcheries.

As stated above, the State aided the work of the United States Fish Commission in a financial way and also by hatching and distributing the eggs turned over to its care. In 1885 the State Legislature passed a bill authorizing the establishment of a hatchery of its own, and the same year such a station was built upon Hat Creek about  $2\frac{1}{2}$  miles above its junction with Pitt River, a tributary of the Sacramento River. As the work of the first few seasons developed that the location was unsuitable, the hatchery was removed in 1888 to Sisson, in Siskiyou County. The work of this hatchery was to handle the eggs turned over to it by the United States Fish Commission.

In 1895 another hatchery was built by the State near the mouth of Battle Creek, a tributary of the Sacramento River. In 1896 and 1897 this hatchery was operated jointly by the State and the United States Fish Commission while awaiting the appropriation of money by the Commission to purchase it from the State.

In the fall of 1897 a hatchery was established by the State at Grizzly Bluff, on Price Creek, a tributary of Eel River, in Humboldt County, and in 1902 this hatchery made the first plant in the State of steelhead trout fry.

Santa Cruz County has had a hatchery at Brookdale for a number of years. In 1911 it was leased to the State and operated by the latter during the seasons of 1911 and 1912. In 1913 the State gave up the lease and entered into a contract to purchase the eggs produced from this hatchery. The price agreed upon was that the State Commission was to pay \$1.50 per thousand for the eyed steelhead eggs, up to the number of 2,000,000, and \$1 per thousand for all eggs up to 3,000,000, provided that the eggs were collected and eyed by a skilled fish culturist and would pass inspection before they were accepted.

A hatchery was established by the United States Bureau of Fisheries at Hornbrook, on Klamath River, in 1913. At first this hatchery was devoted to rainbow trout work, but later the collection and distribution of silver and chinook salmon was taken up.

During the fall of 1911 the State established an experimental station at Sacramento in order to carry on a series of experiments to determine whether the eggs of the quinnat salmon could be successfully hatched and the fry reared near the city of Sacramento. Of the fish hatched at this station 50,000 were marked.

Nearly all of the fry that were liberated in the Sacramento River were floated in a screen cage by boat into the middle of the stream and there released. N. B. Scofield took 500 in a floating box down the river, where they were held and fed for several weeks in brackish and salt water. They were apparently not affected by the changes in the salinity of the water.

Experiments were carried on until the summer of 1913, when they were abandoned due to the killing of the embryos by the mineral substances in the water used at the station.

During the fiscal year 1912 the Mill Creek hatchery of the United States Bureau of Fisheries was operated by the California Commission.

Some years ago the town of Ukiah, Mendocino County, established a hatchery 1 mile from the town, and on Russian River. For some years it was operated as a trout station, but eventually became an important steelhead hatchery. It was not operated in 1913. In 1914 the State Fish Commission collected steelhead eggs

at the Eel River dam of the Snow Mountain Water & Power Co., and having secured permission from the town of Ukiah, hatched them out in its hatchery.

As the Hornbrook hatchery on Klamath River was on private property, the United States Bureau of Fisheries in 1915 removed the buildings from the old location on the south side to property owned by the Government on the north side of the river.

In 1915 new hatchery buildings were erected at the Mill Creek hatchery.

## OUTPUT.

The following tables show separately the quantity of eggs, fry, etc., distributed by the United States Fish Commission and the State since the inception of the work. The large quantity of eggs shown by the Commission represents largely the eggs supplied to the State, which hatched and distributed them, and eggs sent to other States and to foreign countries.

## OUTPUT OF HATCHERIES OWNED BY THE UNITED STATES BUREAU OF FISHERIES.

Years ending June 30 a—	Chinook.		Silver.		Steelhead trout.		Total.	
	Eggs.	Fry.	Eggs.	Fry.	Eggs.	Fry.	Eggs.	Fry.
1872...	30,000						30,000	
1873...	1,400,000						1,400,000	
1874...	4,155,000						4,155,000	850,000
1875...	6,250,000	1,750,000					6,250,000	1,750,000
1876...	5,065,000	1,500,000					5,065,000	1,500,000
1877...	4,983,000	2,000,000					4,983,000	2,000,000
1878...	7,810,000	2,500,000					7,810,000	2,500,000
1879...	4,250,000	2,300,000					4,250,000	2,300,000
1880...	3,800,000	2,000,000					3,800,000	2,000,000
1881...	4,300,000	3,100,000					4,300,000	3,100,000
1882...		3,991,750						3,991,750
1883...		776,125						776,125
1883 b...	3,450,000	1,500,000					3,450,000	1,500,000
1880...	1,554,000	84,000					1,554,000	84,000
1891...	2,988,000	777,000					2,988,000	777,000
1892...	2,902,000	315,500					2,902,000	315,500
1893...	3,530,000	1,190,100					3,530,000	1,190,100
1894...	7,500,000	438,500		280,000		308,500	7,575,000	1,027,000
1895...	3,676,000	500,000	c 1,250,000		175,000	d 1,184,500	3,676,000	2,934,500
1896...	6,170,800	715,700			107,808		6,345,800	823,508
1897...	18,232,590	3,056,701		298,137	50,000	257,000	18,282,590	3,611,838
1898...	30,605,000	15,643,300			60,000	650,000	30,665,000	16,293,300
1899...	27,665,000	3,275,110					27,665,000	3,275,110
1900...	2,925,000	3,533,950					2,925,000	3,533,950
1901...	3,934,036	889,570					3,934,036	889,570
1902...	17,580,410	2,115,560					17,580,410	2,115,560
1903...	11,275,777	1,618,066					11,275,777	1,618,066
1904...	64,598,354	2,350,130					64,598,354	2,350,130
1905...	96,025,765	7,561,380					96,025,765	7,561,380
1906...	107,905,945	e 3,491,405					107,905,945	3,496,405
1907...	73,376,315	2,512,250					73,376,315	2,512,250
1908...	64,990,550	4,780,855					64,990,550	4,780,855
1909...	32,278,265	3,590,078					32,278,265	3,590,078
1910...	30,539,467	2,286,257					30,539,467	2,286,257
1911...	33,364,514	3,666,061	2,289,900				35,654,414	3,666,061
1912...	20,697,550	7,243,325					20,697,550	7,243,325
1913...	17,092,873	2,195,100					17,192,873	2,212,420
1914...	25,373,645	f 9,448,340	100,000	17,320			25,469,485	11,984,800
1915...	20,716,005	g 13,101,539	95,840	2,536,460			20,716,005	14,299,441
			h 1,197,902					
Total...	772,990,861	118,652,652	2,485,740	5,579,819	360,000	2,507,808	775,836,601	126,740,279

a The calendar year was used up to 1889.

b The hatchery was closed from 1884 to 1888.

c Includes 560,000 fingerlings, yearlings, or adults.

d Includes 332,000 fingerlings, yearlings, or adults.

e Includes 138 fingerlings, yearlings, or adults.

f Includes 3,849,991 fingerlings.

g Includes 8,086,139 fingerlings.

h Includes 226,162 fingerlings.

## OUTPUT OF HATCHERIES OWNED BY THE STATE OF CALIFORNIA.

Years.	Chinook.		Silver fry.	Steelhead fry.	Total.	
	Eggs.	Fry. <sup>a</sup>			Eggs.	Fry.
1873.....		520,000				520,000
1874.....		850,000				850,000
1875.....	250,000	2,250,000			250,000	2,250,000
1876.....		2,000,000				2,000,000
1877.....		2,200,000				2,200,000
1878.....		2,500,000				2,500,000
1879.....		2,300,000				2,300,000
1880.....		2,225,000				2,225,000
1881.....		2,420,000				2,420,000
1882.....		3,991,750				3,991,750
1883.....		600,000				600,000
1884.....		150,000				150,000
1885.....		200,000				200,000
1886.....		1,290,000				1,290,000
1887.....		2,168,000				2,168,000
1888.....		1,320,000				1,320,000
1889.....		2,798,000				2,798,000
1890.....		2,651,000				2,651,000
1891.....		3,941,650				3,941,650
1892.....		7,776,400				7,776,400
1893.....		3,435,000				3,435,000
1894.....		15,283,183				15,283,183
1895.....		18,123,000				18,123,000
1896.....		31,476,388				31,476,388
1897.....		21,234,000				21,234,000
1898.....		2,536,000				2,536,000
1899.....		3,239,000				3,239,000
1900.....		16,552,040		301,000		17,153,040
1901.....		20,040,487		120,000		20,160,487
1902.....		63,632,000		90,000		63,722,000
1903.....		87,000,000		108,000		87,108,000
1904.....		105,815,920		243,000		106,058,920
1905.....		71,267,000		352,000		71,619,000
1906.....		60,619,000		170,000		60,789,000
1907.....		28,000,000		517,000		28,517,000
1908.....		28,469,745		637,800		29,107,545
1909.....		29,657,263	2,060,910	1,858,100		33,576,273
1910.....		18,909,445		2,177,958		21,087,403
1911.....		16,277,227	25,000	1,988,500		18,285,727
1912.....		28,290,615	12,500	3,171,683		28,474,198
1913.....		33,313,150	1,417,000	8,582,500		43,312,650
Total.....	250,000	744,622,263	3,515,410	20,311,941	250,000	768,449,614

<sup>a</sup> The greater part of the output of chinook fry was from eggs supplied by the United States Bureau of Fisheries hatcheries in California.

<sup>b</sup> All were lost.

## DISTRIBUTION.

The following table shows, by streams and species, the distribution in California of the eggs, fry, etc., from the hatcheries of the United States Fish Commission and the State. This far from represents the work of the hatcheries, as large quantities of eggs were sent to other States and foreign countries.



## DISTRIBUTION OF SALMON EGGS, FRY, ETC., IN THE WATERS OF CALIFORNIA.

Years.	Klamath River and tributaries.				Redwood Creek and tributaries.			
	Chinook.		Silver.		Chinook fry.	Silver.		Steel-head fry.
	Fry.	Year-lings.	Fry.	Adults and year-lings.		Fry.	Adults and year-lings.	
1890.....	90,000							
1891.....	30,000				25,000			
1892.....	147,600	25,000			142,500			
1893.....	487,200				170,000			
1895.....			300,000	160,000		140,000	400,000	
1896.....					65,700			107,808
1897.....					280,250	124,750		202,000
1898.....	16,000				1,260,000			650,000
1903.....	40,000							
1911.....			2,060,910					
1913.....			17,320					
1914.....	a 2,255,100		2,548,960					
1915.....	5,820,000		1,098,000					
Total.....	8,885,900	25,000	6,025,190	160,000	1,943,450	264,750	400,000	959,808

a Includes 100,000 planted in Smith River.

## DISTRIBUTION OF SALMON EGGS, FRY, ETC., IN THE WATERS OF CALIFORNIA—CON.

Years.	Mad River and North Fork.			Eel River.		Russian River.	Skaggs Springs.	Marin County creeks.
	Chinook fry.	Silver fry.	Steel-head fry.	Chinook fry.	Steel-head fry.	Chinook fry.		
1881.....						15,000	15,000	
1894.....		280,000	308,500					
1895.....		470,000						
1897.....	145,365	173,387	60,000					635,000
1898.....				7,857,388				1,970,000
1899.....				8,202,000				900,000
1900.....				885,000				
1902.....				2,069,500	301,000			
1903.....				5,257,947	120,000			
1904.....				5,200,000	90,000			
1905.....				8,100,000				
1906.....				9,265,920	243,000			
1907.....				7,570,000	352,000	25,000		25,000
1908.....				6,154,000				
1909.....				5,500,000	349,000			
1910.....				5,969,745	334,800			
1911.....								
1912.....	100,000			3,103,660				
1913.....	100,000			1,386,500				
1914.....	225,000			3,723,000				
1915.....	350,000			2,618,150				
Total.....	820,365	923,387	368,500	82,862,810	1,789,800	40,000	15,000	3,530,000

## DISTRIBUTION OF SALMON EGGS, FRY, ETC., IN THE WATERS OF CALIFORNIA—CON.

Years.	Sacramento River and tributaries.					San Francisco Bay streams	San Gregorio River.	Pescadero Creek.	Monterey Bay and tributaries.
	Chinook.			Silver fry.	Steel-head fry.	Chinook fry.			
	Eggs.	Fry.	Yearlings, fingerlings, and adults.						
1873.....	20,000	520,000							
1874.....		850,000							
1875.....	250,000	2,000,000							
1876.....		2,000,000							
1877.....		2,200,000							
1878.....		2,500,000							
1879.....		2,800,000							
1880.....		2,225,000							
1881.....		2,800,000							
1882.....	80,300	3,891,750				20,000	15,000	15,000	30,000
1883.....		600,000							
1884.....		150,000							
1885.....		200,000							
1886.....		1,290,000							
1887.....		3,668,000							
1888.....		1,404,000							
1889.....		3,520,000							
1890.....		2,076,500							
1891.....		4,474,750							
1892.....		8,214,900			45,000				
1893.....		3,935,000							
1894.....		15,683,183	250,000						
1895.....		19,264,086							
1896.....		33,998,300							
1897.....	85,200	16,507,110							
1898.....		5,184,950							
1899.....		4,128,570							
1900.....		16,898,100							
1901.....		16,359,606							
1902.....		60,782,130							
1903.....		94,561,380			108,000				
1904.....		100,038,552							900,000
1905.....		66,209,250			135,000				1,200,000
1906.....		59,245,855			170,000				800,000
1907.....		26,090,000			168,000				
1908.....		24,786,257			303,000				
1909.....		33,323,324							
1910.....		22,949,110							
1911.....		16,691,167				294,660			
1912.....		24,637,864	838,906						
1913.....		28,705,000	9,033,635	1,194,762					
1914.....									
1915.....									
Total....	435,500	736,864,194	10,142,541	1,194,762	929,000	314,660	15,000	15,000	2,930,000

• All were lost.

## DISTRIBUTION OF SALMON EGGS, FRY, ETC., IN THE WATERS OF CALIFORNIA—Con.

Years.	Monterey Bay and tributaries.		Truckee River.	Total.				
	Silver fry.	Steel-head fry.	Chinook fry.	Chinook.			Silver.	
				Eggs.	Fry.	Year-lings, finger-lings, and adults. <sup>a</sup>	Fry.	Adults and year-lings.
1873.				20,000	520,000			
1874.					850,000			
1875.			250,000	250,000	2,250,000			
1876.					2,000,000			
1877.					2,200,000			
1878.					2,500,000			
1879.					2,300,000			
1880.					2,225,000			
1881.			10,000		2,420,500			
1882.				80,300	3,991,750			
1884.					600,000			
1886.					150,000			
1887.					200,000			
1888.					1,200,000			
1889.					3,668,000			
1890.					1,494,000			
1891.					3,575,000			
1892.					2,060,000	25,000		
1893.					5,131,950			
1894.					8,214,900		280,000	353,500
1895.					3,935,000		910,000	560,000
1896.					15,748,883	250,000		107,808
1897.					20,324,701		298,137	262,000
1898.					45,101,688			650,000
1899.				85,200	25,409,110			
1900.					6,069,950			
1901.					4,128,570			
1902.					18,967,600			301,000
1903.					21,657,553			120,000
1904.					65,982,130			90,000
1905.					102,661,380			108,000
1906.					110,204,472			243,000
1907.	80,000				75,029,250		80,000	487,000
1908.	80,000				66,199,855		80,000	170,000
1909.	42,000	1,200			31,590,000		42,000	518,200
1910.					30,766,002			637,800
1911.					33,323,324		2,000,910	1,858,100
1912.					26,152,770			2,177,958
1913.	25,000				18,472,327		42,320	1,983,500
1914.					30,840,904	838,906	2,548,960	3,171,083
1915.	71,000				37,543,160	9,053,635	2,363,762	8,582,500
Total.....	208,000	1,200	260,000	435,500	6838,646,379	10,167,541	8,706,089	21,821,449

<sup>a</sup> Of recent years it has been impossible to show the total number of yearlings, fingerlings, and adults planted, as the State reports do not distinguish them from the fry. Those shown in 1914-15 were reared by the United States Bureau of Fisheries.

<sup>b</sup> After 1911 the practice of showing waters in which steelheads were planted was abandoned as the number of streams was becoming unwieldy.

<sup>c</sup> Includes 25,000 chinook fry placed in Santa Inez River and 25,000 placed in Ventura River in 1915.

## OREGON.

## HATCHERIES ON COASTAL STREAMS.

*Rogue River.*—In 1877 R. D. Hume, who had been packing salmon on this river for some years, erected a hatchery at Ellensburg. In 1888 the Oregon Legislature appropriated a sum of money for the enlargement and support of this hatchery, Mr. Hume to retain complete control. As the location is on tidewater, it is necessary to catch the parent fish and hold them until they are ready to spawn, and in order to do this Mr. Hume had an excavation 32 by 62 feet and 11 feet deep made in the bank of the river. This was lined with concrete 1 foot thick, which, when filled with water, made a pond 30 by 60 feet and 10 feet deep. Over the entire pond he constructed a building which could be closed up so as virtually to exclude the light. It is supposed that retaining the fish in a dark place aids in keeping them in good physical condition until ready to spawn. After the death of Mr. Hume in 1908 this hatchery was taken over and operated by the State.

In 1897 Mr. Hume built and equipped a hatchery on the upper Rogue River at the mouth of Elk Creek, about 26 miles from the town of Central Point, in Jackson County, and, in pursuance of an understanding with the United States Fish Commission, the latter operated then and still continues to operate this plant.

In 1900 the Government established an auxiliary station for the collection of steelhead trout eggs on Elk Creek, about 10 miles above the main station. In 1905 a substation was operated at Grants Pass, while during the fiscal year 1908 and in subsequent years substations were operated at Findley Eddy, on the Rogue River, Illinois River, and Applegate Creek, tributaries of the Rogue.

Many of the eggs gathered at the upper Rogue River stations were shipped to Mr. Hume's hatchery, on the lower river, and there hatched out and planted.

*Coquille River.*—The State formerly had a hatchery on this river, but it was abandoned during the winter of 1902-3. In the winter of 1904-5 a substation was established on one of the tributaries of the Coquille River, about 6 miles from the South Coos River hatchery, and was used in hatching eggs brought to it from the latter place. A station was built on the north fork of the Coquille River in 1910.

*Coos River.*—A hatchery was built by the State in 1900 on the South Coos River, about 20 miles from the town of Marshfield.

*Umpqua River.*—In 1900 the State built a hatchery on the north fork of the Umpqua River, near the town of Glide and about 24 miles east of Roseburg. In 1901 a station was established farther up the north fork, at the mouth of Steamboat Creek. After working here two years the station was moved a couple of miles farther up the stream. In 1907 work was resumed at the original station near Glide, as winter freshets had seriously damaged the upper station. A permanent station was built in 1910.

*Siuslaw River.*—In 1893 the State erected a hatchery on Knowles Creek, a tributary of the Siuslaw River, about 20 miles above the mouth of the river. It was turned over to the United States Fish Commission to operate, but no fish came up to the hatchery because the fishermen lower down stretched their nets entirely across the river.

In 1897 and 1898 the United States Fish Commission operated a hatchery owned by a Mr. McGuire and located close to Mapleton about 2 miles below the head of tidewater.

In 1902 the State established an experimental station at the Bailey place, near Meadow post office. In 1907 a permanent station was established by the State on Land Creek fork of the Siuslaw River.

*Alsea River.*—In 1902 the State established a station on the Willis Vidito place, near the town of Alsea. In 1907 an experimental station was established on this river at the mouth of Rock Creek, about 14 miles above the head of tidewater. In 1910 an experimental station was established between Alsea and tidewater.

*Yaquina River.*—In 1902 the State established a hatching station on the Big Elk River, a tributary of Yaquina River, about 3 miles above its confluence with the main river. This station was made permanent the next year.

*Tillamook Bay.*—In 1902 the State established a station on Wilson River, a tributary of Tillamook Bay, and about 8 miles above tidewater. In 1906 the station was removed to the Trask River, a tributary of Tillamook Bay.

## DISTRIBUTION.

The following table shows the distribution of fry in the coastal streams of the State by the Government and the State:

## DISTRIBUTION OF SALMON FRY, ETC., IN THE COASTAL STREAMS OF OREGON.

Year ending June 30—	Tillamook Bay and tributaries.			Yaquina River.			Alsea River.	
	Chinook fry.	Silverside fry.	Steel- head fry.	Chinook fry.	Silverside fry.	Steel- head fry.	Chinook fry.	Silverside fry.
1898.....	19,994							
1901.....				213,500				
1903.....	251,875			557,700			67,750	
1904.....	799,300			3,144,380	985,220			
1905.....				1,407,470	3,009,075	780,500	1,000,000	1,000,000
1906.....				816,608	4,178,000	1,033,150	806,938	1,785,351
1907.....	312,700	2,648,000		1,919,508	1,955,793	376,245		
1908.....	2,124,000	1,629,000		2,193,043	909,855		199,700	812,300
1909.....		4,896,000	569,680		1,006,309			
1910.....	624,800	3,506,990	2,309,770	324,038	28,815			
1911.....	1,818,245	1,080,000	1,196,000	582,785	2,637,550	621,015	495,950	30,300
1912.....	646,300	1,578,131	761,000	148,992	1,554,602	7,145	287,645	997,455
1913.....	1,747,530	422,886	848,229	727,567	3,288,650		87,935	424,925
1914.....	487,692	1,112,392	660,588					
1915.....	2,833,428		213,900					
Total.....	11,665,869	16,873,399	6,559,177	12,521,091	19,553,869	2,818,055	2,945,918	5,050,331

Year ending June 30—	Siuslaw River.			Umpqua River.		Coos Bay and tributaries.		
	Chinook fry.	Silver- side fry.	Steel- head fry.	Chinook fry.	Steel- head fry.	Chinook fry.	Silver- side fry.	Steel- head fry.
1897.....	180,000							
1898.....	440,275							
1899.....	2,700,000							
1901.....	213,500			730,000		235,000		
1902.....	112,000	214,800		1,136,000		2,416,350		
1903.....	389,239			1,596,213				
1904.....	822,567			1,399,860		4,079,274		
1905.....	435,162	311,900		2,654,925		3,877,172		
1906.....	1,826,531	1,296,732	397,355	4,903,700		2,744,000		
1907.....	608,949	1,030,486		4,685,900		4,014,400		
1908.....	729,130	1,127,293		2,378,853		3,000,000		
1909.....	191,267	1,092,540	98,243	4,093,848		2,084,500	1,032,000	222,000
1910.....	273,352	25,289		5,686,273		1,683,738		
1911.....	594,702	20,693	227,580	2,541,236	293,996	2,374,200		
1912.....	715,758	504,429	72,097	1,053,516		1,767,170	2,317,370	
1913.....	255,028	627,312	106,717	903,704	181,085	1,281,120	962,528	
1914.....	1,062,546	476,273	17,735	1,882,985	80,000	1,331,217	2,973,390	
1915.....	1,472,410		257,850	1,333,171		1,212,805	1,551,645	192,625
Total.....	13,022,416	6,727,747	1,177,577	36,980,184	555,081	32,100,946	8,836,933	414,625

## DISTRIBUTION OF SALMON FRY, ETC., IN THE COASTAL STREAMS OF OREGON—Con.

Year ending June 30—	Coquille River.		Rogue River and tributaries.			
	Chinook fry.	Silverside fry.	Chinook.		Silverside fry.	Steelhead fry.
			Fry.	Yearlings, fingerlings, and adults.		
1877.....			50,000			
1898.....			1,910,045			
1900.....			2,156,945			
1901.....	235,000		2,967,058		128,000	65,850
1902.....			4,750,763		424,530	20,250
1903.....	3,084,577		3,480,300		680,800	
1904.....	1,000,000		9,023,428			8,073
1905.....	2,210,000		4,758,653		1,250,432	531,000
1906.....	2,978,700		47,500	75,000		12,625
1907.....	2,840,000		5,880,290		1,375,000	105,300
1908.....	2,450,000	226,600	6,597,027	170,051	158,000	937,680
1909.....		1,185,800	771,710		643,000	878,847
1910.....			1,430,292			89,850
1911.....	500,000	980,770	1,364,248		501,081	2,592,665
1912.....	196,855	1,672,850	9,574,340		2,355,885	a 1,313,890
1913.....	496,680	962,528	4,169,150		3,198,346	2,795,075
1914.....	491,580	1,331,910	3,752,483		b 7,832,000	1,376,308
1915.....	495,333	1,365,815	4,747,623	9,309	2,336,359	c 3,908,699
Total.....	16,978,725	7,726,273	67,431,855	254,360	20,883,433	11,986,637

Year ending June 30—	Total.				Grand total, all species.
	Chinook.		Silverside fry.	Steelhead fry.	
	Fry.	Yearlings, fingerlings, and adults.			
1877.....	50,000				50,000
1897.....	180,000				180,000
1898.....	2,370,314				2,370,314
1899.....	2,700,000				2,700,000
1900.....	2,156,945				2,156,945
1901.....	4,594,058		128,000	65,850	4,787,908
1902.....	8,415,113		639,330	20,250	9,074,693
1903.....	9,427,654		680,800		10,108,454
1904.....	20,268,809		985,220	8,073	21,262,102
1905.....	16,343,382		5,571,407	1,311,500	23,226,289
1906.....	14,123,977	75,000	7,260,083	1,443,130	22,902,190
1907.....	20,261,747		7,009,279	481,545	27,752,571
1908.....	19,671,753	170,051	4,863,048	937,680	25,642,532
1909.....	7,626,825		9,855,649	1,768,780	19,251,254
1910.....	10,022,493		3,561,094	2,399,620	15,983,207
1911.....	10,071,364		5,250,394	4,931,256	20,253,014
1912.....	14,390,576		10,980,722	2,154,132	27,525,430
1913.....	9,668,714		10,300,012	3,931,106	23,899,832
1914.....	8,905,303		13,725,965	2,134,631	24,765,899
1915.....	12,094,772	9,309	5,253,819	4,573,074	21,930,974
Total.....	193,343,799	254,360	86,064,822	26,160,627	305,823,608

a Includes 177,790 fingerlings, yearlings, and adults.

b Includes 860,903 fingerlings, yearlings, and adults.

c Includes 27,258 fingerlings.

The following tables show the total output of the hatcheries in Oregon owned by the United States Bureau of Fisheries and the State of Oregon:

OUTPUT OF HATCHERIES OWNED BY THE UNITED STATES BUREAU OF FISHERIES.

Year ending June 30—	Chinook.			Silverside.		
	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
1889.....		4,500,000				
1890.....	1,000,000	2,776,475				
1891.....	700,000	4,901,525				
1892.....		1,332,400				
1893.....		4,100,000				
1894.....		213,000				
1895.....	23,000					
1896.....		a 2,832,150	b 557,150			
1897.....		4,922,634				
1898.....		16,915,512				
1899.....	27,000	4,300,200				
1900.....	1,800,000	4,126,367			146,824	
1901.....	1,100,000	1,669,857	1,668		128,000	
1902.....	1,866,000	11,587,061			424,530	
1903.....	4,884,400	5,453,860	250	680,800		
1904.....	3,113,000	15,270,675				
1905.....	30,000	9,822,636			1,250,432	
1906.....	28,200	2,454,371	122,980			300
1907.....	1,661,390	8,542,104				
1908.....	2,045,000	7,844,827	627,856		158,000	57,932
1909.....	3,531,000	5,021,655	2,763		1,799,915	
1910.....	3,953,992	4,220,197	225			
1911.....	600,000	5,686,168	200,000		1,659,681	
1912.....	8,000,000	12,837,840	750,765		2,355,885	
1913.....	21,491,000	11,291,023			3,198,346	
1914.....	1,075,000	12,156,818	602,300		8,441,642	27,258
1915.....	37,000	10,434,517	531,351	76,200	2,373,559	
Total.....	56,965,982	175,213,872	3,397,308	757,000	21,936,814	85,490

Year ending June 30—	Steelhead trout.			Total.		
	Eggs.	Fry.	Fingerlings, yearlings, and adults.	Eggs.	Fry.	Fingerlings, yearlings, and adults.
1889.....					4,500,000	
1890.....				1,000,000	2,776,475	
1891.....				700,000	4,901,525	
1892.....					1,332,400	
1893.....					4,100,000	
1894.....					213,000	
1895.....				23,000		
1896.....					2,832,150	557,150
1897.....					4,922,634	
1898.....					16,915,512	
1899.....	159,000	12,125		186,000	4,312,325	
1900.....	415,000	99,000		2,215,000	4,372,191	
1901.....	246,000	65,850	25,000	1,346,000	1,863,707	26,668
1902.....	481,000	20,750		2,347,000	12,031,841	
1903.....	400,000	262,700	62,033	5,965,200	5,716,560	62,283
1904.....		23,205	11,020	3,113,000	15,293,880	11,090
1905.....	50,000	534,000		80,000	11,607,068	
1906.....	10,000	1,294,485	40,383	38,200	3,748,856	163,663
1907.....	50,000	105,300		1,711,390	8,647,404	
1908.....	263,725	952,680		2,308,725	8,955,507	685,788
1909.....	51,468	1,374,308		3,582,468	8,195,878	2,763
1910.....		2,074,188		3,953,992	6,294,385	225
1911.....		2,914,789		600,000	10,260,638	200,000
1912.....		2,005,100	294,000	8,000,000	17,198,825	1,044,855
1913.....		2,795,075		27,491,000	17,284,444	
1914.....		2,230,008		1,075,000	22,828,468	629,558
1915.....	752,000	3,254,275	910,652	865,200	16,062,351	1,442,003
Total.....	2,878,193	20,017,338	1,343,248	60,601,175	217,168,024	4,826,046

a All but 17,000 of these were from eggs received from the California stations.

b All raised from eggs received from the California stations.



## OUTPUT OF HATCHERIES OWNED BY THE STATE OF OREGON.

Years.	Chinook fry.	Silverside fry.	Steelhead trout fry.	Sockeye fry.	Total.
1877.....	50,000				50,000
1878.....	79,620				79,620
1879.....	1,876,500				1,876,500
1880.....	1,834,290				1,834,290
1881.....	2,554,290				2,554,290
1882.....	1,300,000				1,300,000
1883.....	4,500,000				4,500,000
1884.....	990,000				990,000
1885.....	a 792,000				792,000
1886.....	2,500,000				2,500,000
1887.....	2,500,000				2,500,000
1888.....	2,700,000				2,700,000
1889.....	2,500,000				2,500,000
1890.....	7,562,000		200,000		7,762,000
1891.....	11,220,550	7,957,000	245,000		19,422,550
1892.....	18,502,072	3,285,600	356,327		22,044,000
1893.....	b 48,730,791	3,974,185	300,850		52,005,826
1894.....	16,393,249	5,509,085	143,849		22,046,183
1895.....	c 27,404,596	7,503,655	1,495,735		36,403,986
1896.....	d 25,156,732	6,446,628	1,859,696		33,463,056
1897.....	e 21,209,394	5,359,709	376,245		26,945,348
1898.....	f 20,108,990	9,212,649	1,403,129		30,724,768
1899.....	g 24,169,365	3,631,827	2,364,120		30,165,312
1900.....	h 19,762,229	4,749,319	4,018,598		28,530,146
1901.....	i 18,077,971	9,580,497	1,358,742	k 1,488,327	30,018,473
1902.....	l 26,623,268	9,879,666	1,136,031	m 1,957,825	38,596,790
1903.....	n 21,945,746	5,893,965	753,323	o 1,937,134	30,576,174
1904.....	p 27,532,168	2,917,460	4,793,208		35,242,836
Total.....	358,575,821	85,904,245	20,709,853	7,361,426	472,551,345

a Eggs from which hatched obtained from United States Bureau of Fisheries.

b 6,826,540 eggs were obtained from United States Bureau of Fisheries.

c 7,714,000 eggs were obtained from United States Bureau of Fisheries.

d 3,550,000 eggs were obtained from United States Bureau of Fisheries.

e 3,020,000 eggs were obtained from United States Bureau of Fisheries.

f 6,581,000 eggs were obtained from United States Bureau of Fisheries.

g 6,465,300 eggs were obtained from United States Bureau of Fisheries.

h 3,950,000 eggs were obtained from United States Bureau of Fisheries.

i 1,500,000 eggs were obtained from United States Bureau of Fisheries.

j 3,000,000 eggs were obtained from United States Bureau of Fisheries.

k 2,000,000 eggs were obtained from United States Bureau of Fisheries.

l 2,000,000 eggs were obtained from United States Bureau of Fisheries.

m 21,491,000 eggs were obtained from United States Bureau of Fisheries.

n 1,000,000 eggs were obtained from United States Bureau of Fisheries.

o 2,000,000 eggs were obtained from United States Bureau of Fisheries.

p Eggs were obtained from the United States Bureau of Fisheries.

## COLUMBIA RIVER AND TRIBUTARIES.

The first fish-cultural work upon the Columbia River and in Oregon was at Clackamas, on the Clackamas River, a tributary of the Willamette River, which empties into the Columbia River about 180 miles from its mouth.

This hatchery was built in 1876 by the Oregon & Washington Fish Propagating Co., which operated it until 1880. In 1887 the State provided for and there was appointed a State fish commission. Almost the first work of the commission was to spend \$12,000 appropriated by the legislature to put in repair and operate this hatchery. On July 1, 1888, it was informally turned over to the United States Commission of Fish and Fisheries, which paid over the purchase price, took formal possession in the following winter, and has operated it ever since, with the exception of several years when the building of dams stopped the progress of salmon to the hatchery. During

this period a temporary station for the collection of eggs was established on Sandy River, about 15 miles away, and on Salmon River, a tributary of Sandy River, both tributaries of the Columbia River. Some eggs were also brought in from the California hatcheries and hatched at the Clackamas station. In 1901 the hatchery was moved about 4 miles down the river and has since been operated as both a rearing and a collecting station. In 1901 the State established another hatchery on the Clackamas River about 30 miles below the main station and between the north and south forks. In 1904 all were turned over to the United States. In 1915 the hatchery was moved again. In 1907 an experimental station for the collection of eggs of the early variety of chinook salmon was established by the State of Oregon on the Clackamas River below the Portland Railway, Light & Power Co.'s dam at Cazadero, but this was later operated by the United States Bureau of Fisheries. The building of a dam having cut off this station, another was established in 1913 at a point 30 miles distant from Portland.

In 1889 the State established a hatchery in the cannery of F. M. Warren, at Warrendale, in Multnomah County, on the Columbia River, which was operated in that year and in 1890.

In 1895 some of the Oregon salmon packers combined and organized the Columbia River Packers' Propagating Co., which established a hatchery on the upper Clackamas River at the junction of the Warm Springs and the Clackamas and operated it in 1895 and 1896. The Government operated it in 1897 and 1898, after which it was turned over to the State and moved to the opposite side of the river.

In 1898 the collection of steelhead trout eggs was first undertaken on the northwest coast by the State of Oregon on Salmon River, a tributary of the Columbia River, and met with fair success. In March, 1899, the Government sent a party to the falls of the Willamette River, near Oregon City, to collect steelhead eggs, and also operated for this purpose at its substation on the Salmon River, but the latter effort met with failure, as the rack was washed away. This station was turned over to the State on June 15, 1899.

In 1901 the State of Oregon did some experimental work at Swan Falls, on Snake River, the boundary for a considerable distance between Oregon and Idaho. During the winter and early spring of 1902 the State also worked Tucannon River, which is a tributary of Snake River, for steelhead, but met with poor success. Snake River was worked again in 1902 at the foot of Morton Island, which is situated 2 miles above Ontario, in Malheur County. Title to the necessary property was secured from the War Department in 1903 and permanent buildings were erected. It was closed for some years and finally abandoned in 1911.

In 1901 the State of Oregon established an experimental hatchery in Wallowa County, on the Grande Ronde River, at the mouth of a small tributary called the Wenaha River, which enters the main stream about 50 miles from its mouth. A permanent station was established in the canyon about  $1\frac{1}{2}$  miles below the Wallowa bridge on the Wallowa River, a tributary of the Grande Ronde River, in 1903.

In 1902 the State of Oregon erected a permanent plant on Salmon River at its junction with Boulder Creek. This plant was closed in 1911.

In the same year the State established an experimental station on the McKenzie River, a tributary of the Willamette River, about one-half mile above Vida post office. This experimental work was resumed in 1905 at a point 2 miles below Gate Creek. The hatchery was permanently established at a spot about 30 miles from Eugene and near the town of Leaburg a year or two later.

In 1903 a hatchery was built by the State of Oregon on the Snake River, near the town of Ontario, in eastern Oregon.

In 1906 an experimental station was established by the State on Bréitenbush Creek a short distance above its junction with the Santiam River, a tributary of the Willamette River, but the plant was destroyed, very shortly after its establishment, by a forest fire. An experimental station was reestablished here in 1909, but a heavy freshet raised the river so high that the penned fish escaped around the rack.

In 1909 the State of Oregon built at Bonneville, on Tanner Creek, a tributary of the Columbia River, a large central hatchery capable of handling 60,000,000 eggs, it being the intention of the State to hatch at this plant the eggs collected at other stations.

In the same year a temporary hatchery was located on the Santiam River by the State of Oregon.

During 1910 the State of Oregon received 1,500,000 red-salmon eggs from the Yes Bay (Alaska) hatchery of the United States Bureau of Fisheries, and yearly since they have received a consignment from the same source, as will be noted in the statistical tables. These were hatched out in the Bonneville hatchery and planted in the Columbia River.

The State of Oregon built a hatchery on the Klaskanine River, a tributary of Youngs River, near Olney, in Clatsop County, in 1911. In the same year an eyeing station for spring chinooks was opened by the State on the Willamette River, near Lowell.

The first entrance of Washington (then a Territory) into fish-cultural operations was in 1879, when the State fish commissioner paid the Oregon & Washington Fish Propagating Co., which was operating the hatchery on the Clackamas River, \$2,000 for salmon

fry deposited in that river. In 1893 the State Legislature established a hatchery fund which was to be supplied by licenses from certain lines of the fishery business. In 1895 its first hatchery in the Columbia River Basin was built on the Kalama River, about 4 miles distant from its junction with the Columbia, and in Cowlitz County. Shortly after this hatchery was built it was discovered that it was above where the salmon spawned, and a second hatchery was built  $1\frac{1}{4}$  miles below the first named, as the rugged mountainous character of the country made transportation between the two sites difficult. Of recent years a road has been constructed along the river bank, and it is probable that the upper buildings will be abandoned entirely.

Another station for the collection and eyeing of eggs was established on the Chinook River, a small stream which empties into Baker Bay near the mouth of the Columbia.

During the fiscal year 1897 the United States Fish Commission established a station on Little White Salmon River, a stream which empties into the Columbia, on the Washington side, about 14 miles above the Cascades. During the fiscal year 1901 an auxiliary station was operated on Big White Salmon River, while fishing was carried on in Eagle and Tanner Creeks, in Oregon, the eggs obtained from these creeks being brought to the Little White Salmon hatchery.

In 1899 the State of Washington built and operated hatcheries on the Wenatchee River, a tributary of the Columbia River, about  $1\frac{1}{2}$  miles from Chiwaukum station on the Great Northern Railway, and on Wind River, a tributary of the Columbia, about 1 mile from the junction.

In 1900 Washington State hatcheries were established in the Columbia River Basin as follows: White River hatchery, which was built on Coos Creek, which empties into a tributary of the White River, the location being about  $2\frac{1}{2}$  miles from where the Green River joins the White River; Methow River hatchery, built on the Methow River at the point where it is joined by the Twisp, about 22 miles from the Columbia River; Colville River hatchery, built on the north bank of Colville River, about  $1\frac{1}{2}$  miles from its mouth, and about 1 mile from Kettle Falls; Klickitat River hatchery, located on the east bank of the Klickitat River, about 6 miles from its mouth; and one on the Little Spokane River, about 10 miles from its mouth and about 9 miles north of the city of Spokane. The Klickitat River hatchery never was operated, while most of the others were operated intermittently.

In 1906 a hatchery was established by the State of Washington on the Lewis River, some distance above the town of Woodland.

In 1909 the State of Washington established a hatchery near Pateros, on the Methow River, a tributary of the Columbia River, and on the Tulton.

In 1915 Clarke County, Wash., built a hatchery on the east side of Cold Creek, about 2 miles from the town of Vancouver.

A temporary station was established by the State of Washington on Wenatchee Lake, near Leavenworth, in 1915.

The following table shows the plants of salmon and steelhead trout in the Columbia River and its tributaries by the Bureau of Fisheries and the States of Oregon and Washington:

PLANTS OF SALMON FRY IN THE COLUMBIA RIVER BASIN SINCE 1877.

Years ending June 30—	Columbia River and tributaries.					Total fry.
	Sockeye fry.	Chinook fry.	Silverside fry.	Steelhead trout fry.	Chum fry.	
1877.....		300,000				300,000
1878.....		79,620				79,620
1879.....		3,076,500				3,076,500
1880.....		1,834,290				1,834,290
1881.....		2,554,290				2,554,290
1882.....		1,300,000				1,300,000
1883.....		4,500,000				4,500,000
1884.....		3,756,475				3,756,475
1885.....		5,694,000				5,694,000
1886.....		1,332,400				1,332,400
1887.....		4,100,000				4,100,000
1888.....		213,000				213,000
1889.....		2,523,000				2,523,000
1890.....		10,389,300				10,389,300
1891.....		10,641,394				10,641,394
1892.....		26,212,074				26,212,074
1893.....		19,979,241		8,625		19,987,866
1894.....		22,510,869	7,175,824	299,000		29,985,693
1895.....		24,978,978	5,559,750	245,000		30,783,728
1896.....		44,328,085	17,545,724	256,327		62,130,136
1897.....		40,174,313	8,721,720	4600,583		49,496,616
1898.....		71,694,587	8,422,085	158,981		80,275,653
1899.....		17,107,217	1,354,610	768,235		19,230,062
1900.....		36,372,785	8828,872	1,769,494		38,971,151
1901.....		23,171,235	2,657,349	26,640		25,855,224
1902.....		34,852,008	1,705,543	15,000		36,572,551
1903.....		33,098,943	2,439,415	1,058,657		36,597,015
1904.....		37,744,002	3,374,733	2,063,688		43,182,423
1905.....	1,488,327	28,802,795	3,308,900	1,982,331	420,730	34,003,083
1906.....	1,957,825	50,740,925	1,243,660	1,503,800	106,020	55,552,230
1907.....	1,937,134	70,211,177	4,591,500	40,000	105,800	76,885,611
1908.....	1,978,140	83,727,844	636,900	932,700	591,638	87,867,222
1909.....		82,317,442	608,747	4,128,833	8,299,572	95,354,594
Total.....	7,361,426	800,318,789	68,175,332	15,857,894	9,523,760	901,237,201

<sup>a</sup> Includes 23,000 eggs.

<sup>b</sup> Includes 557,150 yearlings, fingerlings, or adults.

<sup>c</sup> Includes 1,668 yearlings, fingerlings, or adults.

<sup>d</sup> Includes 37,033 yearlings, fingerlings, or adults.

<sup>e</sup> Includes 50,000 eggs.

<sup>f</sup> Includes 48,200 eggs and 47,980 yearlings, fingerlings, or adults.

<sup>g</sup> Includes 300 yearlings, fingerlings, or adults.

<sup>h</sup> Includes 24,388 yearlings, fingerlings, or adults, and 58,000 eggs.

<sup>i</sup> Includes 1,985,746 yearlings, fingerlings, or adults.

<sup>j</sup> Includes 16,949 yearlings, fingerlings, or adults.

<sup>k</sup> Includes 50,000 eggs.

<sup>l</sup> Includes 225 yearlings, fingerlings, or adults.

<sup>m</sup> Includes 25,000 eggs.

<sup>n</sup> Includes 11,700 yearlings, fingerlings, or adults.

<sup>o</sup> Includes 100,000 eggs.

<sup>p</sup> Includes 1,405,860 yearlings, fingerlings, or adults.

<sup>q</sup> Includes 116,300 yearlings, fingerlings, or adults.

<sup>r</sup> Includes 1,000,000 eggs and 1,732,805 yearlings, fingerlings, or adults.

<sup>s</sup> Includes 79,000 eggs.

<sup>t</sup> Includes 812,801 yearlings, fingerlings, or adults.

## WASHINGTON.

*Willapa River.*—In 1899 Washington established a hatchery on Trap Creek, a tributary of the Willapa River, situated about 200 yards from the creek's mouth.

*Chehalis River.*—The construction of a hatchery on the Chehalis River, about 4 miles above the city of Montesano, was begun by the State in October, 1897, but owing to bad weather and extreme high water was not completed until late in 1898. The hatchery was a failure until 1902 when a fair season was had, as was again true in 1903. It was not operated in 1904. Since the State began taking eggs from the Satsop River, a tributary of the Chehalis, it has been possible to fill the hatchery each season.

In 1909 the site where eggs had been gathered on the Satsop River was purchased, and a new hatchery was erected there. It has three concrete rearing ponds and is fully equipped for the taking of spawn and the hatching out and caring for 5,000,000 fry. This plant was first operated in the fall of 1909.

Work was begun in September, 1914, by the United States Bureau of Fisheries on a hatching station on Lake Quinault, Wash., and a take of eggs was made the same year.

In lieu of installing fishways in their dams in the Humptulips River and tributaries, in the Grays Harbor section, two timber firms agreed to furnish the money needed to build a hatchery on Stevens Creek, west of Humptulips, and the same was constructed and put into operation in October of the same year. The plant is now the property of the State.

*Puget Sound and tributaries.*—In 1896 the State established a hatchery on Baker Lake, which is the head of Baker River, a tributary of the Skagit River, and this was the first establishment for the hatching of sockeye salmon. In July, 1899, it was sold to the United States Fish Commission. In 1901 steelhead trout eggs were collected on Phinney Creek, about 5 miles from the town of Birdsvew, and some 30 miles from Baker Lake. In 1901 an auxiliary station was opened at Birdsvew, on Skagit River, and steelhead trout eggs were collected on Phinney and Grandy Creeks and brought to Baker Lake to be hatched.

In 1898 a private hatchery (the necessary money being raised by subscription among the residents of Fairhaven, now Bellingham, and vicinity) was built near Lake Samish, a few miles from Fairhaven.

In 1899 a hatchery was built by the State on Kendall Creek, a tributary of the Nooksak River, about 300 yards from same, and about 2 miles from the railway station of Kendall. Except in 1903, this hatchery has since been operated continuously. An eyeing sta-

tion was built in 1907 on the south fork of the Nooksak River, about 1 mile from Acme.

In the same year the State built a hatchery on the Skokomish River, about 4 miles from its mouth. An eyeing station was also erected on the north fork of the same river. The main station was not operated in 1904 and only on a small scale in 1903 and 1905.

The State in 1889 built a hatchery on Friday Creek, a tributary of the Samish River, situated about 1 mile from the mouth of the creek.

The following State hatcheries were first operated in 1900: Snohomish hatchery, built on the west bank of Skykomish River, a few miles from its mouth; Nisqually River hatchery, built on Muck Creek, about one-half mile from the Nisqually River, and about 4 miles from the town of Roy, in Pierce County; and the Stillaguamish hatchery, located on the Stillaguamish River, about 4 miles from the town of Arlington, in Snohomish County. The latter has since been moved to Jim Creek, a tributary of the south branch of the Stillaguamish River.

The Startup hatchery, located near Startup, on the Skykomish River, was formerly used as a collecting station for the Snohomish hatchery. It is still used for this purpose, but also retains and hatches a considerable quantity of spawn. The station is about 4 miles from the Snohomish hatchery.

In 1900 the State established a fisheries experimental station at Keyport Landing, on the east arm of Port Orchard Bay, with Pearson as the nearest post office. The work of the station was devoted to salmon and oysters until it was abandoned a few years later.

The State established a hatchery on the Dungeness River, about 7 miles from the town of Dungeness, in Clallam County, in 1901. In 1906 it constructed a hatchery on a small tributary of the Skagit River, between Hamilton and Lyman. The station built on Sauk River, a tributary of the Skagit, has been operated only occasionally since the Skagit hatchery was built.

The White River hatchery was constructed on Suice Creek, a tributary of Green River, some years ago. During the summer of 1909 a new hatchery was built at this station, the old one being too small to accommodate the amount of spawn that could be taken. The new hatchery is located on the east side of Suice Creek near the county road. The building contains 140 hatching troughs. The plant has a pond system, where the fry are kept and fed until they are able to shift for themselves.

During the summer of 1911 the city of Tacoma constructed a large concrete dam in the Green River, about 4 miles west of Eagle Gorge.

As this dam prevented the salmon from reaching the spawning beds, the State established an eyeing station the same year just below the dam. In 1913 the name was changed to Green River hatchery, to conform to the name of the main stream.

In 1912 the United States Bureau of Fisheries completed the Quilcene and Duckabush hatcheries. Both are on small tributaries entering the west side of Hoods Canal, an arm of Puget Sound.

In 1913 a new station was operated by the Bureau on the Dusewallips River, a tributary of Hoods Canal, Puget Sound, near Brinnon. Two new field stations—on Elwell River, a tributary of the Skykomish River, near Sultan, and on Sauk River, a tributary of the Skagit River, near Darrington—were also put into operation the same year. The Sauk River had been worked by the State at one time.

In 1913 the Middle Fork Nooksak eyeing station was transformed into a hatchery. In the same year the eyeing station on the south fork was moved farther up the river.

In 1914 stations were established by the United States Bureau of Fisheries on Day Creek and Illabot Creek, tributaries of the Skagit River, while a substation was opened on Hamahama River at Eldon, distant about 9 miles up Hood Canal from the mouth of the Duckabush River.

On May 23, 1914, the Baker Lake hatchery building was destroyed by fire. In addition to the building and equipment, 1,305,820 silver fry and 823,097 sockeye fry were destroyed. The station has since been rebuilt.

In 1915 the State built a hatchery on the Pilchuck River, a tributary of the Skykomish River, near Granite Falls.

In lieu of building a fishway in its dam on the Elwha River, near Port Angeles, the Olympic Power Co. furnished the funds needed to build a hatchery below the dam, and this was opened by the State in 1915.

The following tables show the total output of the salmon hatcheries in the State of Washington owned by the United States Bureau of Fisheries and the hatcheries owned by the State itself:



**OUTPUT OF THE SALMON HATCHERIES IN WASHINGTON OWNED BY THE UNITED STATES  
BUREAU OF FISHERIES.**

Year ending June 30—	Chinook.			Sockeye, or blueback.			Silver, or coho.		
	Eggs.	Fry.	Finger- lings, yearlings, and adults.	Eggs.	Fry.	Finger- lings, yearlings, and adults.	Eggs.	Fry.	Finger- lings, yearlings, and adults.
1897		1,848,760							
1898		7,391,886							
1899	4,926,000	1,791,056							
1900	2,686,000	6,626,947			10,683,000				
1901	6,581,000	5,427,680			3,834,453			174,041	
1902		15,637,687			3,371,000				
1903		16,774,030			3,731,789			81,812	
1904	7,506,000	17,386,183			3,855,000			3,984,645	
1905		4,236,276			7,819,281	10,000	107,000	8,071,081	
1906	7,714,000	14,846,905		880,000	3,285,130	9,500	239,180	6,445,574	
1907	3,550,000	6,512,738			4,224,255		760,000	3,636,952	
1908	1,485,000	12,372,503	1,537,941	75,000	8,514,305		296,000	13,262,714	
1909	3,050,000	11,565,553	14,186	100,000	5,430,626		272,000	7,661,110	
1910	3,813,250	9,175,610			4,554,825		275,000	10,888,025	
1911	3,350,000	7,307,455	11,700		5,496,000		102,000	4,550,615	
1912	8,020,000	10,959,728	655,095		4,692,573		52,000	10,599,939	
1913	19,713,000	19,933,300			5,751,700		102,000	10,754,617	
1914	4,584,000	31,140,440	1,130,505	50,000	2,583,469	120,000		13,591,354	
1915	4,998,000	38,162,139	987,495	155,000	10,820,441	46,575	35,000	20,673,056	41,500
Total..	81,976,250	239,096,876	4,336,922	1,260,000	88,647,847	186,075	2,240,180	114,375,535	41,500

Year ending June 30—	Humpback.		Steelhead trout.			Chum fry.	Total.		
	Eggs.	Fry.	Eggs.	Fry.	Finger- lings, year- lings, and adults.		Eggs.	Fry.	Finger- lings, yearlings, and adults.
1897								1,848,760	
1898								7,391,886	
1899							4,926,000	1,791,056	
1900				26,000			2,686,000	17,335,947	
1901							6,581,000	9,436,174	
1902				110,000				19,118,687	
1903			80,000	440,000	223,815		80,000	21,027,631	223,815
1904		176,597	255,000	70,000			7,761,000	25,472,425	
1905			414,400	3,205			5,521,400	20,129,843	
1906	2,000	969,990	348,000	540,000			9,183,180	26,087,599	9,500
1907			200,000	941,505			4,510,000	15,315,450	
1908	502,000	6,764,762	224,000	136,916			2,582,000	41,051,200	1,537,941
1909			220,000	717,691			3,642,000	25,374,980	14,186
1910		1,368,000	300,000	1,437,038			4,388,250	27,423,498	
1911		96,000	660,000	911,650		69,000	4,112,000	18,430,720	11,700
1912		2,566,325	905,000	2,284,315		2,495,000	8,977,000	33,597,880	655,095
1913		1,880	1,330,000	1,477,150		19,479,000	21,145,000	57,397,647	
1914	13,260,000	21,118,378	729,000	1,792,430		8,672,735	18,623,000	78,898,806	1,250,505
1915		6,929,500	125,000	2,008,698		137,665	5,313,000	114,098,541	1,213,235
Total..	13,764,000	39,991,432	5,790,400	12,896,598	361,480	66,220,442	105,030,830	561,228,730	4,925,977

• Includes 4,355 fingerlings, adults, and yearlings.

## OUTPUT OF THE SALMON HATCHERIES OWNED BY THE STATE OF WASHINGTON.

Year ending June 30—	Chinook fry.	Chum fry.	Hump-back fry.	Silver, or coho, fry.	Sockeye, or blue-back, fry.	Steelhead trout fry.	Total.
1896.....	4,500,000						4,500,000
1897.....	4,050,000				5,500,000		9,550,000
1898.....	4,275,000				5,400,000		9,675,000
1899.....	8,595,000			189,000			8,784,000
1900.....	12,251,600	10,301,760		13,778,280		1,736,560	38,068,200
1901.....	12,275,400	16,478,280		19,747,894		1,398,476	49,900,050
1902.....	14,766,822	9,937,390		32,964,593		2,481,371	60,150,176
1903.....	14,283,499	9,937,390		28,659,079		3,134,076	56,014,044
1904.....	13,261,184		295,200	15,725,196		3,868,866	33,150,446
1905.....	7,101,180			12,226,294		2,433,635	21,761,109
1906.....	10,943,550	3,268,800		28,906,380		2,769,784	45,888,514
1907.....	8,897,670	6,120,000		28,668,600		3,575,943	47,262,213
1908.....	18,647,600	4,342,350	2,655,900	29,273,202		4,578,075	59,497,127
1909.....	17,440,950	8,218,000		24,543,200		4,080,450	54,282,600
1910.....	21,168,350	8,607,500	519,600	30,894,100		4,855,000	66,044,550
1911.....	16,458,502	13,326,750		33,097,750		5,163,180	68,046,182
1912.....	23,380,516	4,684,950	370,785	37,164,125		4,832,067	70,432,443
1913.....	30,542,928	14,711,400		50,263,290		9,089,250	104,606,868
1914.....	35,529,709	7,842,266	1,532,737	33,494,380	49,792	3,601,514	82,050,398
1915 <sup>a</sup> .....	639,784,092	27,458,665	578,504	60,169,474	62,631	3,457,130	131,510,496
Total.....	318,153,552	145,235,501	5,952,726	479,764,837	11,012,423	61,055,377	1,021,174,416

<sup>a</sup> A considerable proportion of the fry was fed in rearing ponds for some time before planting.

<sup>b</sup> 29,900 eggs were distributed in addition.

NOTE.—As the printed reports of the State before 1913 in many instances report as the output the number of eggs gathered, it has been necessary in such cases to make an arbitrary reduction from these figures, in order to allow for the loss in the egg stage.

The following table shows the plantings made in waters of Washington other than the Columbia River by the United States Bureau of Fisheries and the State of Washington:

PLANTS OF SALMON FRY AND FINGERLINGS IN THE WATERS OF WASHINGTON OTHER THAN THE COLUMBIA RIVER.<sup>a</sup>

Year ending June 30—	Puget Sound and tributaries.					
	Chinook.	Sockeye.	Silver, or coho.	Hump-back.	Chum.	Steelhead.
1897.....		5,500,000				
1898.....		5,400,000				
1899.....	7,470,000		189,000			
1900.....		10,683,000	6,749,280		10,301,760	1,572,560
1901.....	300,000	3,834,453	14,360,185		16,478,280	1,398,476
1902.....	2,141,322	3,371,000	23,161,069		9,937,390	2,591,371
1903.....	2,113,850	3,731,789	21,507,771		9,937,390	b 3,326,091
1904.....	1,865,933	3,855,000	14,071,845	471,797		3,518,476
1905.....	2,590,738		16,441,375			c 1,329,940
1906.....	4,819,290	d 3,582,630	e 29,770,414	969,990	1,800,000	f 3,177,174
1907.....	3,907,598		26,960,552	4,224,255	5,220,000	3,964,308
1908.....	8,356,709	8,514,305	37,613,466	9,420,662	2,278,350	4,566,491
1909.....	9,647,288	5,430,626	28,622,310		6,048,000	g 4,499,141
1910.....	11,681,060	4,554,825	36,837,125	1,887,600	7,748,500	6,292,338
1911.....	4,984,482	5,496,000	29,941,865	96,000	12,074,060	4,841,330
1912.....	4,646,254	4,692,573	39,788,614	5,432,110	3,526,170	h 6,733,805
1913.....	7,561,328	5,751,700	56,128,207	1,888	31,408,960	9,731,400
1914.....	7,392,826	i 2,803,261	42,213,911	j 22,651,415	15,535,046	4,444,271
1915.....	15,242,734	7,371,056	74,505,147	7,508,004	51,852,050	4,925,555
Total.....	94,721,412	84,572,238	498,862,136	52,663,721	184,145,956	66,912,727

<sup>a</sup> In addition to the waters given, plants of 19,913 chinook, 3,558,591 blueback, or sockeye, 198,966 silver, or coho, and 10,598 steelhead were made in the Quinalt River in 1915.

<sup>b</sup> Of these, 218,200 were yearlings, fingerlings, or adults.

<sup>c</sup> Of these, 14,400 were eggs.

<sup>d</sup> Of these, 9,500 were yearlings, fingerlings, or adults.

<sup>e</sup> Of these, 14,840 were yearlings, fingerlings, or adults.

<sup>f</sup> Of these, 15,000 were yearlings, fingerlings, or adults.

<sup>g</sup> Includes 100,000 eggs.

<sup>h</sup> Of these, 25,000 were eggs and 1,000 yearlings, fingerlings, or adults.

<sup>i</sup> Includes 50,000 eggs and 120,000 fingerlings.

<sup>j</sup> Includes 4,355 fingerlings.

## PLANTS OF SALMON FRY AND FINGERLINGS IN THE WATERS OF WASHINGTON OTHER THAN THE COLUMBIA RIVER—Continued.

Year ending June 30—	Chehalis River.				Willapa River.			
	Chinook.	Silver, or coho.	Chum.	Steel- head.	Chinook.	Silver, or coho.	Chum.	Steel- head.
1899.....	1,215,000							
1900.....	2,355,300				881,000			190,000
1901.....	1,909,800				553,400			
1903.....					2,163,019	1,800,000		500,000
1904.....	900,000				819,504	204,876		420,390
1905.....					630,000	1,800,000		288,000
1906.....		2,563,380	1,468,800		529,650	2,160,000		171,550
1907.....		2,250,000	900,000		393,660	2,250,000		526,500
1908.....	163,000	3,275,000	2,064,000		678,600	654,500		148,500
1909.....	148,000	1,800,000	1,757,000		322,200	504,000		399,000
1910.....	403,000	1,577,000	859,000		455,200	64,000		
1911.....	111,150	4,041,900	900,960	937,500	734,350	2,457,900		300,000
1912.....	118,750	3,575,700	1,052,760	93,752	748,600	3,111,750		303,825
1913.....	119,700	1,690,200	3,177,680	412,500	729,600	1,386,000		382,500
1914.....	139,000	2,977,260	497,300	701,118	3,247,345	1,785,580		248,555
1915.....	93,250	4,989,440	1,230,000	561,900	302,461	581,730	1,581,750	105,440
Total....	7,675,950	28,739,880	13,907,500	2,706,770	13,288,589	18,760,336	1,581,750	3,984,260

Year ending June 30—	Total by species.						Grand total.
	Chinook.	Sockeye.	Silver, or coho.	Hump- back.	Chum.	Steelhead.	
1878.....	a 3,000						3,000
1897.....		5,500,000					5,500,000
1898.....		5,400,000					5,400,000
1899.....	8,685,000		189,000				8,874,000
1900.....	3,236,300	10,683,000	6,749,280		10,301,760	1,762,560	32,732,900
1901.....	2,863,200	3,834,453	14,360,185		16,478,280	1,398,476	38,934,594
1902.....	2,141,322	3,371,000	23,161,069		9,937,390	2,591,371	41,202,152
1903.....	4,276,869	3,731,789	23,307,771		9,937,390	3,826,091	45,079,910
1904.....	3,585,437	3,855,000	14,276,721	471,797		3,938,866	26,127,821
1905.....	3,220,738		18,241,375			1,617,940	23,080,053
1906.....	5,348,940	3,582,630	34,493,794	969,990	3,268,800	3,348,724	51,012,878
1907.....	4,301,258		31,460,552	4,224,255	6,120,000	4,490,808	50,596,873
1908.....	9,198,309	8,514,305	41,542,966	9,420,662	4,342,350	4,714,991	77,733,583
1909.....	10,117,488	5,430,626	30,926,310		7,805,000	4,898,141	59,177,565
1910.....	12,539,260	4,554,625	38,478,125	1,887,600	8,607,500	6,292,338	72,359,648
1911.....	5,829,982	5,496,000	36,441,665	96,000	12,975,020	6,078,830	66,917,497
1912.....	5,513,604	4,692,573	46,476,064	5,432,110	4,578,930	7,131,382	73,824,663
1913.....	8,410,628	5,751,700	59,204,407	1,888	34,586,640	10,526,400	118,481,663
1914.....	10,779,171	2,803,261	46,976,751	22,651,415	16,032,346	5,393,944	104,636,888
1915.....	15,658,358	10,929,647	80,275,283	7,503,004	54,663,800	5,603,493	174,638,585
Total.....	115,708,864	88,130,809	546,561,318	52,663,721	199,635,206	73,614,355	1,076,311,293

a These were brought from the Clackamas (Oreg.) station and planted in some unnamed lake.

## BRITISH COLUMBIA.

*Fraser River.*—The first hatchery established by the Dominion of Canada on the Pacific coast was erected in 1884 at what is now Bon Accord, a point on the lower river some 4 miles above New Westminster, and on the opposite shore. The next built was in 1901 on Granite Creek, Shuswap Lake, which discharges into the Fraser through the South Thompson River, the lake being about 280 miles from New Westminster. In 1904 another hatchery was established on Harrison Lake on the Lillooet River, first large tributary of the Fraser on the north side; also one about 4 miles east of the lower extremities of Pemberton Meadows, at the junction of Owl Creek

and the Birkenhead River, 4 miles above its confluence with the eastern branch of the Lillooet River, which in turn discharges into Lillooet Lake. In 1907 a hatchery was built on Stuart Lake, near the headwaters of the Fraser.

In 1914 the Bon Accord hatchery had to be abandoned, due to the laying out of a town site around it, and the equipment was transferred to Queen's Park, New Westminster.

The Province of British Columbia owns Seton Lake hatchery, which was established in 1903 on Lake Creek, on the north side, about half a mile from the outlet of Seton Lake, and it has been operated continuously ever since. Seton Lake is a part of the Fraser River chain and is some 300 miles above the mouth of the river. Lake Creek, the outlet of Seton Lake, empties into the Cayoosh Creek, a tributary of the Fraser, 45 miles north of the latter's junction with the Thompson, and 1 mile south of the town of Lillooet.

*Nimkish River.*—In 1902 S. A. Spencer, of the Alert Bay cannery (now belonging to the British Columbia Packers Association), in return for certain special fishery privileges granted by the Dominion, established a hatchery on this river, which is located on the northeast shore of Vancouver Island. The hatchery was burned down in 1903, but was immediately rebuilt. Since its establishment it has been operated by the Dominion.

*Rivers Inlet.*—A hatchery was established by the Dominion on McTavish Creek, one of the tributaries of Oweekayno Lake, about 20 miles up Rivers Inlet, in 1905, and has been operated ever since.

*Skeena River.*—In 1902 the Dominion established a hatchery on Lakelse Lake, in the Skeena River Basin, about 65 miles up the river from Port Essington. In 1907 another was constructed on Babine Lake, the source of the Skeena River.

In 1910 the Dominion put three new hatcheries into operation, all on Vancouver Island. They were located on Anderson Lake, Kennedy Lake, and Cowichan Lake, respectively. The two former are used for sockeyes and the latter for king and coho salmon and steelhead and other varieties of trout.

In 1913, the year of the quadriennially big run of sockeye salmon on the Fraser River, the contractors who were building the new Canadian Northern Railway, in blasting their way along the banks of the river, threw the rock and other débris into the stream until in the narrow part of the canyon south of North Bend at Whites Creek, Hells Gate, China Bar, and Scuzzy Rapids, all within a few miles of each other, the débris formed great sloping banks extending out into the stream at these points, and entirely changed the direction of the currents, and of course, the velocity of the water. At best the salmon had a hard time getting through there, but the added obstructions rendered it practically impossible.

At a rather late hour the authorities woke up to the menace this work was to the run of salmon, and the dumping of débris into the river in such a manner as to obstruct their ascent was stopped.

How to clear the stream once more was now the problem, and this was seriously complicated by a slide of rock which took place in Hells Gate in February, 1914, which narrowed the channel of the stream considerably.

In March, 1914, the Dominion Marine and Fisheries Department contracted with a private concern to remove the obstructions, and this was done from Scuzzy Rapids, China Bar, and Whites Creek entirely within a short period of time, but a couple of seasons' work were required to clear up Hells Gate so as to permit of easy passage for the fish.

The following table shows the plantings made in the waters of British Columbia from the Dominion and provincial hatcheries:

PLANTS OF SALMON FRY MADE IN THE WATERS OF BRITISH COLUMBIA.

Years.	Fraser River. <sup>a</sup>						Total.
	Chum.	Coho, or silver.	Spring, or king.	Hump-back.	Sockeye.	Steel-head trout.	
1885.....					1,800,000		1,800,000
1886.....					2,625,000		2,625,000
1887.....					4,414,000		4,414,000
1888.....					5,807,000		5,807,000
1889.....					4,419,000		4,419,000
1890.....					6,640,000		6,640,000
1891.....					3,603,800		3,603,800
1892.....					6,000,000		6,000,000
1893.....					5,674,000		5,674,000
1894.....					6,300,000		6,300,000
1895.....					6,390,000		6,390,000
1896.....					10,393,000		10,393,000
1897.....					5,928,000		5,928,000
1898.....					5,850,000		5,850,000
1899.....					4,742,000		4,742,000
1900.....					6,200,000		6,200,000
1902 b.....		90,000			15,808,000	75,000	15,973,000
1903.....	75,000	1,750,000	22,000		12,521,000		14,368,000
1904.....		210,000		50,000	13,729,200	12,000	14,001,200
1905.....		5,576,100	4,381,400		9,244,300		19,201,800
1906.....		4,774,000	1,791,500		100,479,000	4,000	107,048,500
1907.....		3,219,200	1,814,900		36,965,900		42,000,000
1908.....		5,890,000	2,815,000	22,500,000	51,856,200		82,060,200
1909.....		7,375,400	5,772,400		41,909,500		55,057,300
1910.....		450,000	6,300,000		105,312,500		112,062,500
1911.....		5,313,800	2,129,500		24,146,300		31,594,600
1912.....		3,899,500	5,962,500	28,773,350	34,183,850		72,819,200
1913.....	1,100,000	1,995,600	4,533,550		41,062,700		48,691,850
1914.....		1,522,000	50,000	500,000	92,308,000		94,380,000
1915.....	125,000	2,196,000	2,614,700		27,496,000		32,431,700
Total.....	1,300,000	44,216,600	38,187,450	51,823,350	693,807,250	91,000	\$29,475,650

<sup>a</sup> Some of the reports from the provincial hatchery at Seton Lake show merely the take of eggs; it has been necessary to make an arbitrary reduction in order to show the loss of eggs and fry before planting.

<sup>b</sup> No plants made in 1901.

## PLANTS OF SALMON FRY MADE IN THE WATERS OF BRITISH COLUMBIA—Continued.

Years.	Skeena River.			Rivers Inlet.			Nimphish River.
	Hump-back.	Sockeye.	Total.	Spring, or king.	Sockeye.	Total.	Sockeye.
1903.....		3,450,000	3,450,000				1,636,000
1904.....		4,000,000	4,000,000				2,496,000
1905.....		3,767,900	3,767,900				2,850,000
1906.....		3,784,450	3,784,450		8,000,000	8,000,000	4,873,400
1907.....		4,125,750	4,125,750		8,440,000	8,440,000	4,870,000
1908.....		8,946,950	8,946,950	4,705,000	8,594,000	13,300,000	4,800,000
1909.....		11,882,400	11,882,400		13,300,000	13,300,000	4,500,000
1910.....		11,521,700	11,521,700		12,750,000	12,750,000	5,055,000
1911.....		12,556,470	12,556,470		11,436,000	11,436,000	6,414,000
1912.....		12,367,500	12,367,500		11,791,000	11,791,000	5,114,500
1913.....		11,430,430	11,430,430		10,981,000	10,981,000	4,981,000
1914.....		11,843,200	11,843,200		12,397,000	12,397,000	5,053,000
1915.....	16,000	11,899,613	11,915,613		12,712,000	12,712,000	4,880,000
Total.....	16,000	111,576,363	111,592,363	4,706,000	110,401,000	115,107,000	57,522,900

Years.	Vancouver Island.					
	Chum.	Coho, or silver.	Spring, or king.	Sockeye.	Steelhead trout.	Total.
1911.....	40,000	4,550,000	425,000	7,862,000	145,200	13,022,200
1912.....		3,487,500	456,000	13,620,750	37,200	17,601,450
1913.....		3,180,000	712,500	15,031,750	173,900	19,098,150
1914.....		2,252,000	701,000	15,314,500	87,200	18,354,700
1915.....		2,229,220	250,600	15,911,000	55,000	18,445,820
Total.....	40,000	15,698,720	2,545,100	67,740,000	498,500	86,522,320

a Includes 80,000 coho fry.

## PLANTS OF SALMON FRY MADE IN THE WATERS OF BRITISH COLUMBIA—Continued.

Years.	Total by species.						Grand total.
	Chum.	Coho, or silver.	Spring, or king.	Hump-back.	Sockeye.	Steel-head trout.	
1885.....					1,800,000		1,800,000
1886.....					2,625,000		2,625,000
1887.....					4,414,000		4,414,000
1888.....					5,807,000		5,807,000
1889.....					4,419,000		4,419,000
1890.....					6,640,000		6,640,000
1891.....					3,603,800		3,603,800
1892.....					6,000,000		6,000,000
1893.....					5,674,000		5,674,000
1894.....					6,300,000		6,300,000
1895.....					6,390,000		6,390,000
1896.....					10,393,000		10,393,000
1897.....					5,928,000		5,928,000
1898.....					5,850,000		5,850,000
1899.....					4,742,000		4,742,000
1900.....					6,200,000		6,200,000
1902.....		90,000			15,808,000	75,000	15,973,000
1903.....	75,000	1,750,000	22,000		17,607,000		19,454,000
1904.....		210,000		50,000	20,225,200	12,000	20,497,200
1905.....		5,576,100	4,381,400		15,862,200		25,819,700
1906.....		4,774,000	1,791,500		117,136,850	4,000	123,706,350
1907.....		3,219,200	1,814,900		54,401,650		59,435,750
1908.....		5,890,000	7,521,000	22,500,000	74,196,150		110,107,150
1909.....		7,375,400	5,772,400		71,591,900		84,739,700
1910.....		450,000	6,300,000		134,639,200		141,389,200
1911.....	40,000	9,868,800	2,554,500		62,414,770	145,200	75,023,270
1912.....		7,387,000	6,418,500	28,773,350	77,077,570	37,200	119,693,620
1913.....	1,100,000	5,175,600	5,246,050		83,486,880	173,900	95,182,430
1914.....		3,744,000	751,000	500,000	136,915,700	87,200	141,997,900
1915.....	125,000	4,425,220	2,865,300	16,000	72,898,613	55,000	80,385,133
Total.....	1,340,000	59,935,320	45,438,550	51,839,350	1,041,047,483	589,500	1,200,190,203

## ALASKA.

In 1891 several of the canneries operating at Karluk, on Kodiak Island, combined forces and built a hatchery on the lagoon at that place. As the cannery men were at swords' points in regard to their fishing rights on the spit, in 1892 the hatchery was closed. In May, 1896, the Alaska Packers Association broke ground for a hatchery at the eastern end of the lagoon, near the outlet of Karluk River, a short distance from where the hatchery was located in 1891, and operated it until 1916, when it was closed temporarily.

In 1892 Capt. John C. Callbreath, manager of the Point Ellis cannery, on Kuiu Island, operated a small hatchery on the left bank of Kutlakoo stream. It was a very primitive place, and an exceptionally high tide destroyed the whole plant in September. It was never rebuilt.

Capt. Callbreath, however, after seeing to the operation of the hatchery, had returned to Wrangell during the summer, where his attention was again attracted to hatchery work, and in the fall of 1892 he built a small hatchery on Jadeska stream, Etolin Island, about 200 yards from its mouth. The stream is about one-half mile in length and is the outlet of a small lake. Finding the location unsuitable Capt. Callbreath removed the hatchery in 1893 to the northern side of the lake, about three-eighths of a mile from the head of the outlet, where it still stands. The owner's intention was to build up a stream which had a small natural run of red salmon until it had a large run, with the hope that the Government would then give him the exclusive right to take these fish from the stream for commercial purposes. The experiment was kept up until the end of the season of 1905, when Capt. Callbreath's failing eyesight compelled the cessation of the actual hatching. Until 1910 a man was stationed on the stream during the run of spawning fish for the purpose of lifting them over the dam, so that they could reach the spawning beds at the head of the lake, and the project was abandoned entirely shortly thereafter. The owner's expectation of a big run as a result of hatching operations was never realized.

In 1896 the Baranof Packing Co., which operated a cannery on Redfish Bay, on the western coast of Baranof Island, built a small hatchery on the lake at the head of Redfish stream. The following winter was so cold that not only the flume, but the whole cataract, froze solid, and as the hatchery was thus left without water the eggs were put into the lake and left to their fate and the hatchery closed down permanently.

In 1897 the North Pacific Trading & Packing Co., at Klawak, Prince of Wales Island, established a hatchery near the head of Klawak stream, close to Klawak Lake. In 1898 the plant was moved to the mouth of a small stream entering the lake about halfway up the

western shore. This hatchery has been operated continuously ever since. In 1909 the North Alaska Salmon Co. acquired a half interest in it, which it relinquished to the original owners a few years later.

The Pacific Steam Whaling Co., in 1898 erected a small hatchery on Hetta Lake, on the west side of Prince of Wales Island, which was operated until the close of the hatching season of 1903-4, when the Pacific Packing & Navigation Co., successor to the original owner, went into the hands of a receiver. In 1907 it was reopened by the Northwestern Fisheries Co., which had acquired the interests of the old company, and has been operated each season since.

Up to 1900 the work of hatching salmon was entirely voluntary on the part of the packers. On May 2 of that year the following regulation was promulgated at the Treasury Department, which at that time had control of the Alaska salmon-inspection service:

7. Each person, company, or corporation taking salmon in Alaskan waters shall establish and conduct, at or near the fisheries operated by him or them, a suitable artificial propagating plant or hatchery; and shall produce yearly and place in the natural spawning waters of each fishery so operated red-salmon fry in such numbers as shall be equal to at least four times the number of mature fish taken from the said fisheries, by or for him or them, during the preceding fishing season. The management and operation of such hatcheries shall be subject to such rules and regulations as may hereafter be prescribed by the Secretary of the Treasury. They shall be open for inspection by the authorized official of this department; annual reports shall be made, giving full particulars of the number of male and female salmon stripped, the number of eggs treated, the number and percentage of fish hatched, and all other conditions of interest; and there shall be made a sworn yearly statement of the number of fry planted and the exact location where said planting was done.

On January 24, 1902, this regulation was amended so as to require the planting of "red-salmon fry in such numbers as shall be equal to at least ten times the number of salmon of all varieties taken from the said fisheries."

Although the regulation was mandatory, but few of the packers obeyed it, some because no suitable place was to be found within a reasonable distance of their plants, others because the establishment and operation of such a hatchery would cost more than their returns from the industry justified, and others because of lack of knowledge required in hatchery work. The greater number of them absolutely ignored it, and as a result those who conformed to the regulation were placed under a heavy financial handicap. The injustice of this arrangement was patent on its face, and in 1906, when a comprehensive revision of the law was made by Congress, provision was made for reimbursing in the future those cannery men who operated salmon hatcheries. The section covering this point reads as follows:

SEC. 2. That the catch and pack of salmon made in Alaska by the owners of private salmon hatcheries operated in Alaska shall be exempt from all license fees and taxation of every nature at the rate of ten cases of canned salmon to every one thousand red or king salmon fry liberated, upon the following conditions.



That the Secretary of Commerce and Labor may from time to time, and on the application of the hatchery owner shall, within a reasonable time thereafter, cause such private hatcheries to be inspected for the purpose of determining the character of their operations, efficiency, and productiveness, and if he approve the same shall cause notice of such approval to be filed in the office of the clerk or deputy clerk of the United States district court of the division of the District of Alaska wherein any such hatchery is located, and shall also notify the owners of such hatchery of the action taken by him. The owner, agent, officer, or superintendent of any hatchery the effectiveness and productiveness of which has been approved as above provided shall, between the thirtieth day of June and the thirty-first day of December of each year, make proof of the number of salmon fry liberated during the twelve months immediately preceding the thirtieth day of June, by a written statement under oath. Such proof shall be filed in the office of the clerk or deputy clerk of the United States district court of the division of the District of Alaska wherein such hatchery is located, and when so filed shall entitle the respective hatchery owners to the exemption as herein provided; and a false oath as to the number of salmon fry liberated shall be deemed perjury and subject the offender to all the pains and penalties thereof. Duplicates of such statements shall also be filed with the Secretary of Commerce and Labor.

It shall be the duty of such clerk or deputy clerk in whose office the approval and proof heretofore provided for are filed to forthwith issue to the hatchery owner, causing such proofs to be filed, certificates which shall not be transferable and of such denominations as said owner may request (no certificate to cover fewer than one thousand fry), covering in the aggregate the number of fry so proved to have been liberated; and such certificates may be used at any time by the person, company, corporation, or association to whom issued for the payment pro tanto of any license fees or taxes upon or against or on account of any catch or pack of salmon made by them in Alaska; and it shall be the duty of all public officials charged with the duty of collecting or receiving such license fees or taxes to accept such certificates in lieu of money in payment of all license fees or taxes upon or against the pack of canned salmon at the ratio of one thousand fry for each ten cases of salmon. No hatchery owner shall obtain the rebates from the output of any hatchery to which he might otherwise be entitled under this act unless the efficiency of said hatchery has first been approved by the Secretary of Commerce and Labor in the manner herein provided for.

Of recent years so much objection has been raised to the system of hatchery rebates that the matter of the Federal Government taking over all private hatcheries in Alaska, at a fair valuation, and operating same, is being favorably considered.

In 1901 the Pacific Steam Whaling Co. established two small hatcheries—one on Nagel Stream, which enters the northern side of Quadra Lake, on the mainland of southeast Alaska, and one on a stream entering Freshwater Lake Bay, Chatham Strait. Both were closed down in 1904 when the company failed. In 1908 the Northwestern Fisheries Co., which had acquired the Quadra plant, removed it to a small stream entering the head of the lake and has operated it ever since.

In 1901 the Alaska Packers Association erected a hatchery on Heckman Lake, the third of a series of lakes on Naha Stream, Revillagigedo Island, and about 8 miles from Loring, where the association has a cannery. This is without question the largest and costliest salmon hatchery in the world, having a capacity of 110,000,000 eggs,

and the association is entitled to great credit for the public spirit it has shown and the work it has done, entirely without remuneration until 1906, in building and operating not only this hatchery but also the one at Karluk.

The Union Packing Co., at Kell Bay, on Kuiu Island, and F. C. Barnes, at Lake Bay, on Prince of Wales Island, in 1902 built and operated small hatcheries, both of which were abandoned after one season's work.

Up to 1905 the work of hatching salmon in Alaska was confined to the salmon cannery men. In that year, however, the United States Bureau of Fisheries erected a hatchery on Yes Lake, which empties through a short stream into Yes Bay, on Cleveland Peninsula. In 1907 the bureau constructed another hatchery, on Afognak Lake, near Litnik Bay, Afognak Island.

The eruption of Katmai Volcano, on the Alaska Peninsula, June 6, 1912, covered the island of Afognak with volcanic ash and sand to an average depth of 9 inches. It is estimated that 20,000 salmon perished at the head of Litnik Lake, while thousands were driven back into the ocean. As a result of these conditions the work at the Afognak station was much hampered and curtailed. Even as late as 1915 work at this station was still being hampered by the volcanic ash and sand which fell in 1912.

In 1913 collecting stations were established at Eagle Harbor and Uganak Lake, on Kodiak Island. In 1915 another was established at Seal Bay, on Afognak Island.

In 1913 a collecting station was established on Ketchikan Creek, but, owing to the objections of the citizens of the town against the taking away of the eggs, the station was abandoned in 1915.

The following tables show the eggs gathered and the fry planted by the Government and privately owned hatcheries in Alaska:

OUTPUT OF THE SALMON HATCHERIES IN ALASKA OWNED BY THE UNITED STATES BUREAU OF FISHERIES, 1906 TO 1915.

Year ending June 30—	Yes Lake hatchery.							
	Red, or sockeye.		Coho, or sil- ver, fry.	Steel- head fry.	Humpback.		Total.	
	Eggs.	Fry.			Eggs.	Fry.	Eggs.	Fry.
1906.....		6,638,550						6,638,550
1907.....		54,610,800		143,500				54,754,300
1908.....		61,369,000						61,369,000
1909.....		48,653,000	9,900					48,662,900
1910.....		69,879,600						69,879,600
1911.....		68,239,900			100,000		100,000	68,239,900
1912.....		68,335,000						68,335,000
1913.....		60,422,100						60,422,100
1914.....	2,000,000	42,726,400				4,500,000	2,000,000	47,226,400
1915.....		37,445,000			2,000,000		2,000,000	37,445,000
Total.....	2,000,000	518,319,350	9,900	143,500	2,100,000	4,500,000	4,100,000	522,972,750

\* Includes 2,925,000 fingerlings, yearlings, or adults.

OUTPUT OF THE SALMON HATCHERIES IN ALASKA, OWNED BY THE UNITED STATES  
BUREAU OF FISHERIES, 1906 TO 1915—Continued.

Year ending June 30—	Afognak hatchery.					
	Red, or sockeye.		Coho, or silver, fry.	Humpback.		Total.
	Eggs.	Fry.		Eggs.	Fry.	
1909.....		39,325,870			10,000	39,335,870
1910.....		71,647,170			363,740	72,010,910
1911.....		26,755,000			364,150	27,119,150
1912.....		18,394,700		3,271,740		18,394,700
1913.....		12,551,100				12,551,100
1914.....	3,970,000	7,761,705	50,000		12,034,399	3,970,000
1915.....		a 6,387,080		12,500,000	b 343,480	12,500,000
Total.....	3,970,000	182,822,625	50,000	15,771,740	13,115,769	19,741,740
						195,988,394

Year ending June 30—	Total, by species.						Grand total.	
	Red, or sockeye.		Coho, or silver, fry.	Steel- head fry.	Humpback.			
	Eggs.	Fry.			Eggs.	Fry.	Eggs.	Fry.
1906.		6,638,550						6,638,550
1907.		54,610,800		143,500				54,754,300
1908.		61,369,000						61,369,000
1909.		87,978,870	9,900			10,000		87,998,770
1910.		141,526,770				363,740		141,890,510
1911.		94,994,900			100,000	364,150	100,000	95,359,050
1912.		86,729,700			3,271,740		3,271,740	86,729,700
1913.		72,973,200						72,973,200
1914.	5,970,000	50,488,105	50,000			16,534,399	5,970,000	67,072,504
1915.		c 43,832,080			14,500,000	d 343,480	14,500,000	e 44,175,560
Total..	5,970,000	701,141,975	59,900	143,500	17,871,740	17,615,769	23,841,740	718,961,144

a Includes 5,444,830 fingerlings, yearlings, or adults.

b Includes 119,480 fingerlings, yearlings, or adults.

c Includes 8,369,830 fingerlings, yearlings, or adults.

d Includes 119,480 fingerlings, yearlings, or adults.

e Includes 8,469,310 fingerlings, yearlings, or adults.

## OUTPUT OF PRIVATE SALMON HATCHERIES OF ALASKA, 1893 TO 1915.

[Unless otherwise stated in footnotes, all of the fry liberated were red salmon.]

Year ended June 30—	Callbreath's hatchery.		Karluk hatchery.		Klawak hatchery.	
	Eggs.	Fry.	Eggs.	Fry.	Eggs.	Fry.
1893.....	900,000	600,000				
1894.....	3,000,000	2,204,000				
1895.....	6,300,000	5,291,000				
1896.....	6,200,000	5,475,000				
1897.....	4,400,000	4,390,000	3,236,000	2,556,440		
1898.....	3,400,000	2,526,000	8,454,000	6,340,000	2,023,000	800,000
1899.....	3,000,000	2,050,000	4,491,000	3,369,000	3,600,000	3,000,000
1900.....	3,400,000	2,335,000	10,496,900	7,872,000	3,600,000	a 1,000,000
1901.....	(b)		19,334,000	15,566,800	(c)	
1902.....	6,000,000	5,500,000	32,800,000	28,700,000	3,500,000	2,800,000
1903.....	6,000,000	5,000,000	23,400,000	17,555,000	3,500,000	1,500,000
1904.....	6,000,000	5,000,000	28,113,000	22,000,000	3,000,000	1,700,000
1905.....	6,050,000	5,250,000	45,500,000	33,670,000	2,800,000	2,000,000
1906.....	7,700,000	6,500,000	36,933,000	28,236,412	2,800,000	2,300,000
1907.....	(d)	(d)	38,679,200	36,846,000	3,600,000	1,187,000
1908.....	(e)	(e)	47,808,200	43,655,000	3,500,000	2,776,000
1909.....	(e)	(e)	40,320,000	37,105,000	3,500,000	3,200,000
1910.....	(e)	(e)	45,228,000	40,620,000	5,800,000	5,300,000
1911.....	(e)	(e)	49,626,000	37,722,000	6,786,500	6,200,000
1912.....			41,026,800	37,495,100	5,600,000	3,500,000
1913.....			45,600,000	41,803,155	3,835,000	3,675,000
1914.....			34,629,160	31,546,080	3,645,000	3,465,000
1915.....			f 30,240,000	27,704,000	3,816,000	3,653,000
Total.....	g 63,350,000	52,121,000	585,915,260	500,361,987	64,905,500	48,086,000

Year ended June 30—	Hetta hatchery.		Quadra Bay hatchery.		Freshwater Bay hatchery.	
	Eggs.	Fry.	Eggs.	Fry.	Eggs.	Fry.
1893.....						
1894.....						
1895.....						
1896.....						
1897.....						
1898.....						
1899.....	2,800,000	2,600,000				
1900.....	2,000,000	1,500,000				
1901.....	1,800,000	a 500,000				
1902.....	2,500,000	1,700,000	4,500,000	3,500,000	1,500,000	1,000,000
1903.....	4,800,000	4,000,000	5,500,000	4,000,000	(b)	(b)
1904.....	5,127,500	3,750,000	600,000	c 400,000	(d)	(d)
1905.....	(h)	(h)	(h)	(h)	(h)	(h)
1906.....	(h)	(h)	(h)	(h)	(h)	(h)
1907.....	(h)	(h)	(h)	(h)	(h)	(h)
1908.....	8,000,000	6,125,000	(h)	(h)	(h)	(h)
1909.....	8,400,000	8,134,000	3,325,000	3,025,750	(h)	(h)
1910.....	10,313,000	9,000,000	10,863,000	9,850,000	(h)	(h)
1911.....	9,141,000	8,552,500	11,200,000	10,350,000	(h)	(h)
1912.....	2,585,000	2,342,000	11,000,000	10,166,000	(h)	(h)
1913.....	3,780,000	3,592,000	10,000,000	8,127,000	(h)	(h)
1914.....	4,082,000	3,590,500	18,400,000	17,054,000	(h)	(h)
1915.....	7,438,500	7,142,500	21,300,000	20,300,000	(h)	(h)
Total.....	72,767,000	62,528,500	96,688,000	86,772,750	1,500,000	1,000,000

a Many eggs frozen.

b No run of fish.

c Hatchery was not used, the eggs being hatched out in the lake.

d No report.

e Fish coming in to spawn were lifted over the dam.

f A collection of 7,400,000 humpback eggs was made for Afognak, and these appear in the report of that hatchery.

g A considerable proportion of these are coho eggs.

h Not operated.

## OUTPUT OF PRIVATE SALMON HATCHERIES OF ALASKA, 1893 TO 1915—Continued.

Year ended June 30—	Fortmann hatchery.		Kell Bay hatchery.		Total.	
	Eggs.	Fry.	Eggs.	Fry.	Eggs.	Fry.
1893.....					900,000	600,000
1894.....					3,000,000	2,204,000
1895.....					6,300,000	5,291,000
1896.....					6,200,000	5,475,000
1897.....					8,636,000	6,946,440
1898.....					13,877,000	9,666,000
1899.....					13,891,000	11,019,000
1900.....					19,496,900	12,707,000
1901.....					21,134,000	16,066,800
1902.....	11,460,000	10,300,000			62,260,000	53,500,000
1903.....	40,050,000	29,005,000	2,500,000	2,000,000	85,750,000	63,060,000
1904.....	22,203,000	13,780,000	(a)	(a)	65,043,500	46,630,000
1905.....	65,010,000	63,181,000	(a)	(a)	119,360,000	104,101,000
1906.....	68,715,000	67,643,000	(a)	(a)	116,148,000	104,679,412
1907.....	105,450,000	80,973,000	(a)	(a)	147,729,200	119,006,000
1908.....	<sup>b</sup> 41,280,000	33,920,000	(a)	(a)	100,588,200	86,476,000
1909.....	24,465,000	22,785,000	(a)	(a)	80,010,000	74,249,750
1910.....	53,340,000	50,725,000	(a)	(a)	125,544,000	115,495,000
1911.....	34,920,000	30,245,000	(a)	(a)	111,673,500	93,069,500
1912.....	107,520,000	100,335,000	(a)	(a)	167,731,800	153,868,100
1913.....	23,160,000	20,800,000	(a)	(a)	86,375,000	77,997,155
1914.....	9,480,000	8,700,000	(a)	(a)	70,236,160	64,355,580
1915.....	22,500,000	20,820,000	(a)	(a)	85,294,500	79,619,500
Total.....	629,553,000	553,212,000	2,500,000	2,000,000	1,517,178,760	1,306,082,237

a Not operated.

b Includes 30,000 coho eggs taken and 27,000 fry liberated.



# FISH LAWS OF MISSISSIPPI RIVER STATES

A DIGEST OF STATUTES RELATING TO THE  
PROTECTION OF FISH AND MISCELLANEOUS  
AQUATIC ANIMALS OF STATES BORDERING  
ON THE MISSISSIPPI RIVER

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By EMERSON STRINGHAM

*Scientific Assistant, Bureau of Fisheries*

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Appendix IV to the Report of the U. S. Commissioner of Fisheries for 1916





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# FISH LAWS OF MISSISSIPPI RIVER STATES: A DIGEST OF STATUTES RELATING TO THE PROTECTION OF FISH AND MISCELLANEOUS AQUATIC ANIMALS OF STATES BORDERING ON THE MISSISSIPPI RIVER.

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## INTRODUCTION

This digest of the laws as they existed January 1, 1917, is based upon the statutes or pamphlet copies of the statutes as issued by the commissions or wardens of the several States, as follows:

*Arkansas*.—Act 124, 1915, and "Game and fish laws of the State of Arkansas" (no date).

*Illinois*.—Game and fish act of 1915.

*Iowa*.—Fish and game laws in force July 4, 1915.

*Kentucky*.—Fish and game laws in force June 14, 1916.

*Louisiana*.—Conservation laws, compiled 1914-15, and acts of State of Louisiana, 1916.

*Minnesota*.—Game and fish laws, 1915.

*Mississippi*.—Code of 1906 and session laws 1908 to 1916, inclusive.

*Missouri*.—Game law as amended by Forty-eighth General Assembly (1915).

*Tennessee*.—Game and fish law. (Ch. 152, acts 1915.)

*Wisconsin*.—Chapter 594, laws 1915.

Section references used hereinafter are for the sections as numbered in the pamphlet copies of the laws. The Louisiana and Kentucky pamphlets include several statutes, each with its own series of numbers for sections; to have indicated the act each time would have made references cumbersome, and it was thought better to avoid this even at the cost of some indefiniteness in references.

Penalties, administration, and procedure, have not been covered; the last includes authority to arrest, seize unlawful implements, etc., rewards for information as to violations, forgery of licenses, provisions for witnesses, limitations of times within which actions may be commenced, sale or destruction of things confiscated, and disposition of fines, fees, etc. Special provisions for counties, and other subdivisions of the States are not always included in the pamphlet copies of game laws, and are generally not digested herein.

The omission of provisions as to administration is not due to a belief that these are of minor importance. Probably they are as well worth attention as the provisions for size limits and so on. In most fields of legislation efficient administration is now recognized to be at least of equal importance with wise substantive provisions. But the question of administration is so different that it seems better not to attempt to combine it with this brief treatment of closed seasons and such matters. The United States Department of Agriculture issues annually a "Directory of Officials and Organizations Concerned with the Protection of Birds and Game." Of the States under consideration, Illinois (sec. 25 of act) and Minnesota (sec. 4761 of act) have statutory provision for a fish culturist and superintendent of fisheries, respectively; the other States do not provide by statute for any officials separately concerned with fish.

It is hoped that this digest will be of service to both commercial and game fishermen, especially those who move from State to State, and possibly that it may be found useful by legislators and those interested in legislation, and in some small measure contribute to greater uniformity of fish protective laws. It has not been possible, within reasonable limits, to give in detail all provisions regulating commercial fishing, but an effort has been made to indicate every such provision not restricted to special waters or subdivisions of the State.

## I. NAMES OF FISHES.

As the same species or genus is given different names in different statutes, and even in the same statute, the names by which the fishes will be distinguished herein are listed, together with cross references from other names that are in common use or are found in the statutes. When a genus includes more than one species, all the species are often, perhaps usually, included under one English name, so that such names are commonly generic rather than specific, at least on the Mississippi River. Because of the infinite confusion in the use of these popular names it can not always be determined with certainty to what species or genus a statute refers. Care has been taken to be as accurate as possible under these circumstances.

**Barfish.** See Bass, striped.

**Bass, black.** *Micropterus* Lacépède, both species.

**Bass, calico.** See Crappie.

**Bass, gray.** See Bass, black.

**Bass, Oswego.** See Bass, black.

**Bass, rock.** *Ambloplites rupestris* (Rafinesque), and probably *Chenobryttus gulosus* (Cuvier and Valenciennes).

**Bass, silver.** See Bass, striped; Crappie.

**Bass, strawberry.** See Crappie.

**Bass, striped.** *Roccus chrysops* (Rafinesque) and *Morone interrupta* Gill.

**Bass, white.** See Bass, striped; Crappie.

**Bass, yellow.** See Bass, striped; Bass, black.

**Billfish.** See Gar.

**Black-fin.** See Cisco.

**Bowfin.** *Amiatus calva* (Linnaeus).

**Buffalofish.** *Ictiobus* Rafinesque, all species and probably *Carpiodes* Rafinesque, all species.

- Bullhead.** *Ameiurus* Rafinesque, all species of the region, doubtless excepting *lacustris* (Walbaum).
- Burbot.** *Lota maculosa* (Le Sueur).
- Carp.** *Cyprinus carpio*, Linnaeus, and probably (but not in Illinois) *Carpiodes* Rafinesque, all species.
- Cat, shovel-nose.** See Paddlefish.
- Cat, spoonbill.** See Paddlefish.
- Catfish.** *Ictalurus* Rafinesque, all species; *Leptops olivaris* (Rafinesque); and probably *Ameiurus lacustris* (Walbaum), and in some cases all species of *Ameiurus*, the bullheads.
- Chub.** See Minnow. The "chub" of Illinois (Lake Michigan) is herein called cisco.
- Cisco.** *Leucichthys* Dybowski, or *Argyrosomus* Agassiz, all species. See also Tullibee.
- Crappie.** *Pomoxis* Rafinesque, both species.
- Dace.** See Minnow.
- Dogfish.** See Bowfin.
- Drum, fresh-water.** *Aplodinotus grunniens* Rafinesque.
- Eel-pout.** See Burbot.
- Gar.** *Lepisosteus* Lacépède, all species.
- Gaspergou.** See Drum, fresh-water.
- Grayling.** *Thymallus* Cuvier, all species.
- Grinell (Grindle).** See Bowfin.
- Hackleback.** See Sturgeon.
- Herring, lake.** See Cisco.
- Lawyer.** See Burbot, also Bowfin.
- Longjaw.** See Cisco.
- Minnow.** Cyprinidæ, except *Cyprinus carpio* Linnaeus, the carp.
- Muskellunge.** *Esox masquinongy* Mitchell.
- Paddlefish.** *Polyodon spathula* (Walbaum).
- Perch, black.** See Bass, rock.
- Perch, lake.** See Perch, yellow.
- Perch, pike.** *Stizostedion* Rafinesque, both species.
- Perch, ring.** See Perch, yellow.
- Perch, white.** See Drum, fresh-water.
- Perch, yellow.** *Perca flavescens* (Mitchill).
- Pickrel.** *Esox* Linnaeus, all species except *masquinongy*, the muskellunge.
- Pike.** See Pickerel. The "pike" of Wisconsin and Iowa is herein called pike perch.
- Pike, blue.** See Perch, pike.
- Pike, sand.** See Perch, pike.
- Pike, wall-eyed.** See Perch, pike.
- Quillback.** *Carpiodes* Rafinesque, all species. See also Carp and Buffalo-fish.
- Redhorse.** *Moxostoma* Rafinesque, all species, and *Placopharynx duquesnii* (Le Sueur).
- Sac-a-lait.** See Crappie.
- Salmon, jack.** See Perch, pike.
- Salmon, landlocked.** *Salmo sebago* Girard.
- Salmon, wall-eye.** See Perch, pike.
- Salmon, yellow.** See Perch, pike.
- Sauger.** *Stizostedion canadense* (Smith). See Perch, pike.
- Shad, gizzard.** *Dorosoma cepedianum* (Le Sueur).
- Shad, hickory.** See Shad, gizzard.
- Sheepshead.** See Drum, fresh-water.
- Spoonbill.** See Paddlefish.
- Sturgeon.** Acipenseridæ.
- Sucker.** Catostomidæ, except, usually or always, the genera *Ictiobus*, *Carpiodes*, *Moxostoma*, and *Placopharynx*.
- Sunfish.** *Lepomis* Rafinesque, all species.
- Trelipie.** See Tullibee.
- Trout.** *Salvelinus* (Nilsson) Richardson, all species except *Salvelinus namaycush* (Walbaum), the lake trout, and its subspecies; also *Salmo* (Artemis) Linnaeus, all species of the region except *Salmo sebago* Girard, the landlocked salmon. See also Trout, lake.
- Trout, brook.** *Salvelinus fontinalis* (Mitchill). See Trout.
- Trout, brown.** See Trout.
- Trout, green.** See Bass, black.
- Trout, lake.** *Cristivomer*, or *Salvelinus namaycush* (Walbaum).
- Trout, rainbow.** See Trout.
- Tullibee.** *Leucichthys tullibee* (Richardson), and probably other species of the same genus; name used in Minnesota. See also Cisco.
- Wall-eye.** *Stizostedion vitreum* (Mitchill). See Perch, pike.
- Whitefish.** *Coregonus clupeaformis* (Mitchill), *C. Albus* Le Sueur, and *C. quadrilateralis* Richardson.

## II. TIME, PLACE, AND MANNER OF CAPTURE.

TABLE OF PROVISIONS FOUND IN STATUTES GENERALLY, WITH REFERENCES TO SECTIONS OF PAMPHLET LAWS.

Subject.	Ark.	Ill.	Iowa.	Ky.	La.	Minn.	Miss.	Mo.	Tenn.	Wis.
	<i>Sec.</i>	<i>Sec.</i>	<i>Sec.</i>	<i>Sec.</i>	<i>Sec.</i>	<i>Sec.</i>	<i>Sec.</i>	<i>Sec.</i>	<i>Sec.</i>	<i>Sec.</i>
Fish generally, or certain species, or in certain places, shall not be taken in nets, or shall be taken only with hook and line.....	18	35, 41	2	1, 2	{ 33 40	4808 4838	{ 6535 6548	45		{ 62.30 62.33 62.40
Minnow seine permitted.....	41	37	2, 4	7	33			6548	{ 45 46	{ 62.33 62.41 62.28 62.29 62.35 62.36 62.37 62.39 62.43
Close seasons provided as hereinafter noted.....	18	35, 36	{ 2, 9 11 13		37, 60	(a)	{ 6548 6551	17		
Fishing rear dam or fishway or both prohibited; hook and line excepted in Iowa, Missouri, Tennessee, and Wisconsin.....		25	2			4864		6549	49	62.29
Use of either poison, drugs, etc., or explosives, prohibited.....	45, 49	40	3	3	57	4865	{ 1173 11329	6537 6538	45	62.32
Fishing on premises of another without consent, prohibited.....	47, 48	40B		1259	26					
Authorization to take fish for scientific purposes, or to propagate, or to destroy noxious species.....		38	9	3	19, 47	{ 4758 4771 4846	{ 6524 6568 6570 6571 6572			{ 62.15 62.50 62.55 62.56 62.57
Provision for private ponds.....			8	1-5, 1252	{ 22, 54, 61	{ 4777 4861 4862 4870		6548	45	{ 62.55 62.58
Areas may be closed to mussel fishing.....		57				(b)				

<sup>a</sup> Ch. 261 of 1915, and sec. 4807, 4808, 4820, 4821, 4829, 4830, and 4874.<sup>b</sup> Ch. 276, laws 1915.

## PROVISIONS PECULIAR TO THE RESPECTIVE STATES, WITH REFERENCES TO SECTIONS OF PAMPHLET LAWS.

**Arkansas.**—Mesh of nets shall be at least 3 inches square; no seine, net, trap, or other device shall be used March 1 to June 15 (sec. 18). In some counties nets and similar devices are prohibited (sec. 41, 44).

**Illinois.**—Hoop, fyke, dip nets, or baskets with mesh not less than 1½ inches square, may be used July 1 to April 15 and seine with same mesh September 1 to April 15, except for black bass, pickerel, pike perch, whitefish, trout, cisco, and yellow perch (sec. 35). Gill and pound nets with mesh not less than 2½ inches square may be used for whitefish and lake trout December 1 to November 1 (sec. 36). Gill, dip, and pound nets with mesh not less than 1¼ inches square may be used for cisco, or with mesh not less than 1⅙ inches square for yellow perch, provided not over 10 per cent of catch at any lift consists of lake trout of a less weight than 1¼ pounds dressed each, and such lake trout may be sold only locally and not shipped (sec. 36). Rough fish may be taken from fish preserves by net under special permit (sec. 35). Maximum lengths for nets are: Hoop, fyke, or pound 200 yards and seine 1,000 yards; they shall not obstruct more than half the width of a watercourse (sec. 39).

Firearms, artificial lights, snare spears, gig graines, and trammel nets shall not be used to catch fish (sec. 40B).

Mussel fishing may be practiced commercially with one boat only or an additional boat for towing, and with only two crowfoot bars not over 16 feet long each, and only one dredge not over 3 feet long; such fishing is permitted only April 15 to November 30 (sec. 55).

Frogs over quarter pound shall not be taken May or June (sec. 34).

**Iowa.**—Closed seasons are as follows: "Salmon" and trout, October 1 to April 15; "bass," pike perch, crappie, pickerel, catfish, and "other game fish," December 1 to May 15 (sec. 2); in interstate waters pike perch, bass, and crappie, March 31 to June 1 (sec. 13). The statute does not define "game" fish, but Mr. E. C. Hinshaw, the State game warden, writes under date of December 14, 1915, that the Department of Fish and Game construes it to include any food fish that takes a live bait. Bag limit is 40 of said species, and not over 20 of them shall be bass, pike perch, or pickerel (sec. 2). Fishing is prohibited in streams stocked with breeding trout over two years old within one year from date of stocking, if notice be posted (sec. 2). In ice fishing no structure for protection against the weather or means for creating artificial heat may be used (sec. 2). Only two lines with one hook each, or three united hooks in trolling may be used (sec. 5).

One set line may be used, May 15 to December 1, in streams, in Big Sioux River and boundary portion of Des Moines River, but shall not extend more than halfway across (sec. 2 and 11). Spears may be used to take carp, sucker, redhorse, and buffalofish in slues, etc., of Mississippi River (sec. 2).

From certain lakes, buffalofish, carp, quillback, redhorse, suckers, and gar may be taken in nets under special permit and supervision of warden, but no seine shall be used December 1 to June 15 (sec. 9). Nets may be used in Mississippi and Missouri Rivers, but shall have mesh not less than  $2\frac{1}{2}$  inches stretch measure (sec. 11). It is unlawful to net food fishes and not use them (sec. 14).

**Kentucky.**—Except in private ponds, it is forbidden to use wing net, set net, seine, trap, trammel net, dip net, or other contrivance (sec. 2), or to shoot fish (sec. 4), or to use gig or spear, or to fish by groping, grabbing, tickling or in other manner with the hands, except hook and line, trot line, hand line, or set line (sec. 5), or to kill or stun fish by striking upon the rocks or ice (sec. 6).

**Louisiana.**—Bag limit is 25 black bass, striped bass, or crappie, and 100 "perch" and sunfish (resolution of Conservation Commission adopted September 10, 1912). Specified game fish shall be caught with rod, hook and line only, having not more than five sets of hooks, or with a trolling line and artificial bait (sec. 40).

Hoop nets are prohibited in bayous, lagoons, and streams less than 40 yards wide and seining in fresh water is prohibited; except in certain waters for common species such as buffalofish and catfish under permit by Commission (sec. 33); letter of the president of the Conservation Commission to Dr. H. M. Smith, United States Commissioner of Fisheries, dated October 25, 1915, includes paddlefish and "gaspergou" (fresh-water drum) as such common species. Seines shall not be used within 100 feet of the shore and shall not exceed 900 feet in length; splashing of water or pounding of boat to drive fish into seine is not permitted; vegetation hauled out with seine must be returned to the water; gars taken in seine must be killed. (Rules on permits issued by Conservation Commission.) Permits may be revoked if shown to be detrimental to game fish resources (sec. 33). Hoop nets must be made of twine and be at least 3-inch mesh on bar between knot and knot (sec. 64). Seine, hoop net, or set line shall not be used for buffalofish February 15 to April 15, or for paddlefish January 1 to July 15, or for catfish May 15 to July 15; no paddlefish shall be had in possession which does not contain roe suitable to be made into caviar (sec. 37). Puddling water to catch fish, and using lights, fyke, gill, or trammel nets, or other permanent set means are prohibited (sec. 44, 45, 55), hoop nets are probably not intended to be included in this prohibition for they are regulated as hereinbefore noted.

The Conservation Commission may prohibit the taking of any kind of fresh-water fish in any part of the State for not over three years (sec. 24, 52).

Diamond-back terrapin shall not be taken or sold April 15 to June 15; if artificially propagated they may be taken or sold during that period, but not for food (sec. 60, 61). Nest or eggs of terrapin must not be molested (act 50 of 1910).

Salt-water operations for fish, shrimp, and oysters are regulated by several acts.

**Minnesota.**—Close season for trout, except lake trout, is September 1 to April 15; for black bass, March 1 to May 29; other varieties of fish, March 1 to May 1 (sec. 4807). Bag limit is 25 crappie or trout, 15 pike perch, 15 bass, except rock bass, and no person shall have in possession more than 25 bass (sec. 4808), and the taking of over 25 fish in one day is prohibited, with exceptions (sec. 4896). Crappie, trout, pike perch, and bass (except rock bass) shall be taken only with hook and line and not more than one line shall be used with not more than one bait, except that 3 artificial flies may be used in trout fishing (sec. 4808). Fishing for game fish in interstate waters is prohibited March 1 to May 29 (sec. 4830). Provision is made for closing trout streams to all fishing except during season for trout (sec. 4857–4859). And there are provisions for special localities (sec. 4885–4895).

Fishing by means of set lines (sec. 4835), fishhouse (sec. 4866), and tip-ups (sec. 4867, 4868) is regulated; see also provisions as to license fees for pole and line fishing by nonresidents, and set line fishing. Spears may be used for pickerel, suckers, redhorse, carp, and bullhead, subject to numerous restrictions (sec. 4808).

Netting in inland lakes for whitefish and tullibee is permitted with numerous restrictions (sec. 4808). In the Mississippi River within the State (from Falls of St. Anthony to 1,000 feet above the mouth of the St. Croix River) pound net, seine, or dip nets may be used to take sturgeon, redhorse, bowfin, buffalofish, catfish, pickerel, carp, and suckers, as follows: Not within 1,000 feet of mouth of a stream; pound net not over 75 feet long; seine not over 150 feet long; mesh in all cases not less than 2½ inches on bar (sec. 4819). Netting in certain waters is allowed for specified rough fish, under supervision of warden and subject to exceptions and to provisions as to mesh, bond, and reports, except, for most waters, April 1 to October 1 (ch. 261, laws 1915). In international waters pound and gill nets may be used by United States citizens, resident in Minnesota, under restrictions as to size, mesh, number of nets, leads, position, and season (sec. 4820, 4821). Netting in Lake Superior (except for cisco) is prohibited November 1 to December 1; also prohibited within half mile of shore (sec. 4874). In interstate waters fish, except catfish under 15 inches rough, 12 inches dressed, “pike” (pike perch?), pickerel, bass, sunfish, yellow perch, and crappie, may be taken by residents with nets, set lines, and spears, except April 15 to June 15 (sec. 4826, 4827, 4829, 4833, 4834, 4835); no license is required for spearing (sec. 4833); the mesh is limited for each kind of net and for different parts of the same kind (sec. 4834); set lines may have not more than 25 hooks, shall not be baited with live bait, and no person may have more than one (sec. 4835); nets must bear license number above water, and seines shall not be longer than 4,000 feet and shall not be raised at night (sec. 4840); fyke nets must be raised at least weekly (sec. 4841).

Mussel fishing may be practiced commercially with one boat only, or an additional boat for towing, and with only two crowfoot bars not over 16 feet long each and only one dredge not over 3 feet long with prongs or forks not more than 4 inches long (ch. 276, sec. 3, laws 1915).

Commission may prescribe a closed season for frogs in certain districts (ch. 288, laws 1915).

**Mississippi.**—Boards of supervisors have authority to regulate the times and the places in which and the circumstances under which fish may be taken (sec. 2306); they may entirely prohibit the catching of fish for one or more years or seasons when they believe that the supply of fish is about to be exhausted (sec. 2309); they may prohibit the use of seines, barrel nets, gill nets, and other like contrivances, or any of them, or may restrict the use of the same to places which annually go dry, and may prohibit or regulate the use of the same in particular waters, and may prescribe what kinds of seines or nets may be used and when and where (sec. 2312). Fish trap may be prohibited or regulated by boards, but shall not wholly obstruct the passage of fish (sec. 2313).



**Missouri.**—Fishing through ice is prohibited (sec. 6549).

Not more than 50 pounds of fish, in addition to one individual fish, shall be giggered or speared in one day, and that for domestic use only. Giggering and spearing are prohibited December to April; all fishing, except hook and line and giggering, are prohibited April and May; it is unlawful to seine, net, or trap within 100 yards of the mouth of any stream or slue emptying into the Mississippi or Missouri Rivers; these prohibitions do not apply to private ponds or to fish taken by residents for domestic use from temporary overflows; the owner of the land, or other person by his permission, may use a 2-inch mesh seine to take fish from unnavigable streams for consumption but not for sale during July, August, and September; bowfin, paddlefish, and gars may be taken at any time or in any manner, except by explosives; seines, trammel and hoop nets with mesh at least 2-inch are permitted in the Mississippi and Missouri Rivers June to March, but not within 300 yards of the mouth of any stream or slue (sec. 6548).

Pearl fishing is prohibited March to June (sec. 6551).

**Tennessee.**—Closed season on trout, black bass, landlocked salmon, crappie, and rock bass is May 1 to June 15 (sec. 47).

Seines are prohibited, but trammel nets, baskets, dip nets, and set nets with mesh at least 2-inch may be used in designated rivers, but not within 200 feet of any inlet (sec. 49).

**Wisconsin.**—Close seasons (omitting most provisions for special counties, or bodies of water) are as follows, all dates being inclusive: Black bass, March 2 to May 28. Crappie, rock bass, pike, perch, and pickerel in counties bordering on the Mississippi River and on various inland waters, March 2 to May 28. Pike perch and pickerel on outlying waters except Mississippi River, March 11 to April 30. Catfish on Mississippi River and Lakes Pepin and St. Croix and inland waters, March 2 to May 28. Muskellunge on inland waters, March 2 to May 28. Trout on inland waters, except some counties, September 1 to April 14. Yellow perch in counties bordering on Mississippi River and on certain inland waters, March 2 to May 28. Sunfish in counties bordering on Mississippi River, March 2 to May 28. Lake trout on Lake Superior, September 16 to October 14 (sec. 62.28).

Bag limit for trout is 45 a day and for black bass and yellow bass 15 a day (sec. 62.28).

All fishing is prohibited: (1) In unnavigable waters containing trout, during the close season for trout; (2) or at any time in any spring hole or artificial well connected with any of the waters of the State; (3) or by means of shutting or drawing off water for that purpose (sec. 62.29).

Not more than five lines may be used with not more than one hook each, and they shall not be left unattended; spearing for rough fish is prohibited: (1) In unnavigable waters containing trout, (2) in navigable waters containing trout during the close season for trout, (3) in certain specified waters, and (4) at night time in inland waters; the use of snag line or snag pole is prohibited (sec. 62.30).

Fishing through ice is prohibited: (1) On certain waters, and (2) under protection of any shelter except on certain waters (sec. 62.31).

Net and set line fishing is regulated as follows: No seine shall be drawn over spawning beds of game fish during their spawning season; no apron or other device to catch small fish shall be used in pound net; no net shall shut off more than two-thirds of any channel or passageway of a stream; nets and set lines must have flags bearing license number; licensees must permit State officials to accompany them and the officials may at any time raise set lines; lifting nets at night in Great Lakes waters is forbidden; buffalofish, carp, burbot, gar, redhorse, suckers, bowfin, and fresh-water drum shall not be returned to waters (sec. 62.33). Set lines of specified lengths are authorized in the Mississippi River and other specified waters, subject to various regulations (sec. 62.39).

Elaborate and complicated regulations are provided for net and set line fishing in Great Lakes waters (sec. 62.34). Net fishing is prohibited in the Mississippi River and Lakes Pepin and St. Croix: (1) April 16 to June 14, inclusive, (2) at all times in specified waters, and (3) for pike perch, bass of any variety, crappie, sunfish, pickerel, and yellow perch; in said waters seines shall not exceed 4,000 feet, and mesh shall be not less than 5-inch on the wings, or 4-inch in the center of the pot, the pot not exceeding 150 feet, and gill nets shall have mesh not less than 7-inch, and pound nets not less than 6-inch in the leaders, 5-inch in the hearts, or 3 inch in the hoops, and bait nets shall be used without leads, have mesh not less than 3-inch and front hoop not over 4 feet (sec. 62.35).

Gill netting in certain inland lakes for whitefish and cisco is authorized for a short season (sec. 62.36). Netting in inland waters, with specified exceptions, for specified rough fish, is authorized, subject to various restrictions (sec. 62.37, 62.38). Dip nets of specified sizes may be used without license to capture various rough fishes in specified waters (sec. 62.40).

Gill nets may be used to take lake trout and whitefish during specified dates and for the purpose of propagating these species, under special permit by the commission (sec. 62.57).

Minnow seines shall not be used in some waters (sec. 62.41).

Crawfish and crabs shall not be taken March 1 to June 10, or frogs during March and April, except that frogs may be had in possession by a person in the business of propagating them for scientific purposes (sec. 62.43). Frogs shall not be taken from lands owned by another without his consent (sec. 4565dm).

Nonresident mussel fishermen may use one boat only. Mussels shall not be taken with a dredge (sec. 62.44).

### III. SIZE LIMITS FOR AQUATIC ANIMALS.

TABLE OF LIMITS WITH REFERENCES TO SECTION OR SECTIONS OF PAMPHLET LAWS OF EACH STATE.

Names.	Ill., sec. 41, 42, 42A, 56.	Iowa.		La., sec. 37, 40, 60.	Minn. <sup>a</sup>	Mo., sec. 6550.	Tenn., sec. 50.	Wis., sec. 62.28, 62.33, 62.34, 62.35.
		Inter- state waters, sec. 13.	State generally, sec. 2.					
Fish, except rock bass, sunfish, and bullheads.....	In.	In.	In.	In.	In. 6	In.	In.	In.
Rough fish in outlying waters, except bait.....								7
Bass, black.....	10	11	10	8	9	11	7	10
Bass, rock.....	6						6	
Bass, striped.....	8	8	10	8		8		
Buffalofish.....	18	15		12				
Bullhead.....	7							
Carp.....	15	15						
Catfish.....	13	13	10	12	(b)	13		(b)
Crappie.....	8	8	8			8	6	7
Drum, fresh water.....	10					10		
Muskellunge.....					30			(b)
Perch, pike.....	13	15	12		(b)	11		13
Perch, yellow.....	7							
Pickerel.....	18	18	12			11		16
Salmon, landlocked.....							7	
Sturgeon.....		(b)			(b)			
Sunfish.....	4					6		
Trout.....			10			8	7	7
Trout, lake.....	(b)				(b)			(b)
Whitefish.....	(b)				(b)			(b)
Mussels.....	2				1½			
Turtle or terrapin, or both.....	7			b 5½				

<sup>a</sup> Minnesota: Sec. 4827, 4873, and ch. 276, Laws 1915.

<sup>b</sup> See text following.

## PROVISIONS PECULIAR TO THE RESPECTIVE STATES.

**Arkansas.**—No limits.

**Illinois.**—Restrictions do not apply to pole and line fishing. The limit on lake trout and whitefish is  $1\frac{1}{4}$  pounds. The catfish restriction states "blue and channel catfish."

Fish measurements are taken for "the length of the entire fish from the extreme tip of the snout to the extreme end of the tail fin," and turtle or terrapin for the extreme ends of the shell.

**Iowa.**—A different limit is set for the species of sturgeon, being 1 pound for the sand sturgeon, or shovel-nose sturgeon, or hackleback, *Scaphirhynchus platyrhynchus* (Rafinesque), and 3 pounds for the rock sturgeon or lake sturgeon, *Acipenser rubicundus* Le Sueur; the former would perhaps include the white sturgeon, *Parascaphirhynchus albus* Forbes and Richardson. The limit on lake trout and white fish is  $1\frac{1}{4}$  pounds.

**Kentucky.**—No limits.

**Louisiana.**—The terrapin restriction is only on the diamond-back. Size limits for salt-water species are fixed by acts 53 and 54 of 1914.

**Minnesota.**—Measurements are taken from tip of snout to fork of tail. A different size limit is set for the two species of pike perch, being 14 inches or 1 pound dressed for the wall-eye, and 10 inches for the sauger. Catfish under 15 inches tip to tip rough, or 12 inches dressed shall not be taken in nets in interstate waters. The limit on sturgeon is 15 pounds dressed weight; on lake trout 2 pounds round, or undressed weight, and  $1\frac{1}{2}$  pounds dressed weight; and on whitefish  $2\frac{1}{2}$  pounds undressed weight, or 2 pounds dressed weight.

**Mississippi.**—No statutory limits. County boards have general authority to protect fish (sec. 2305-2315).

**Missouri.**—Measurements are taken from nose to fork of tail. The restrictions are applicable only to fish sold. The catfish restriction states "blue or channel catfish."

**Wisconsin.**—Measurements are taken from tip of snout to tip of tail. The limit for catfish in the Mississippi River and Lakes Pepin and St. Croix is 15 inches round and 12 inches with head off; in all other waters  $1\frac{1}{2}$  pounds round and 1 pound dressed. The limit on muskellunge is 5 pounds round and 4 pounds dressed. Lake trout less than 14 inches long shall not be taken with pound net in specified Great Lakes waters. The limit on whitefish is 2 pounds round and  $1\frac{1}{2}$  pounds dressed.

## IV. LICENSES REQUIRED AND FEES THEREFOR.

**Arkansas.**—The fee for devices other than hook and line for the purpose of catching fish for market is \$25 (sec. 16); and for using artificial bait \$1 (sec. 17).

**Illinois.**—Fees for net fishing are as follows, the amounts in parentheses being for nonresidents: Each 100 yards of seine \$5 (\$10); dip or fyke nets, \$1 (\$2); hoop net, 50 cents (\$2); basket or trap net, 50 cents (?); in operation of gill or pound nets, steam tug, \$25 (\$200), gasoline launch, \$15 (\$50), sail or row boat, \$10 (\$30) (sec. 22). Clerk's fee is 25 cents extra (sec. 23).

Owners of property, their children and tenants may do net fishing, without license, from waters wholly within their property and not connected with any open stream (sec. 22). Gill and pound nets shall be operated only from a boat as listed hereinbefore (sec. 39). The fee for conducting a wholesale fish business is \$10.50 (sec. 24). The commercial mussel fishing fee is \$1.25 for residents and \$25.50 for nonresidents; plus in either case \$25 if a dredge is used (sec. 55).

**Iowa.**—Fees for nets in the Mississippi and Missouri Rivers are as follows: Each 500 feet of seine, \$10; pound net having more than 100 feet of lead on each side, \$4;

pound net with less lead, \$1; each bait, dip, hoop, and fyke net, 50 cents; each 300 feet of trammel net used for floating fishing, \$5. Metal tags are required and non-residents must give bond (sec. 11).

**Louisiana.**—Fees for seines are as follows: Less than 300 feet, \$25; 300 to 600 feet, \$50; 600 to 900 feet, \$100 (sec. 33). Fees for wholesale dealing in fresh-water fish are \$5 to \$150, depending on the amount of business and whether the dealer is a resident or nonresident (sec. 34, 35). Fees for vessels purchasing fresh-water fish to make a cargo are \$5 to \$40, depending on tonnage of boat (sec. 36). The fee for buying and selling diamond-back terrapin is \$25, and for buying, selling and shipping \$100 for a resident and \$200 for a nonresident or unnaturalized foreign-born resident (sec. 63).

The fees for salt-water operations are fixed by several acts.

**Minnesota.**—Licenses of Wisconsin are accepted if it reciprocates (sec. 4845 and ch. 276 of laws 1915).

The fee for seine, pound, or dip nets in the Mississippi River within the State is \$5 for each net (sec. 4819). In international waters the fees are \$25 for pound net and \$10 for gill net (sec. 4820, 4821). In interstate waters the fees are: For seine \$1 a hundred feet up to 500 feet, then \$2 a hundred to 1,000 feet, then \$3 a hundred to 1,500 feet, then \$4 a hundred to 2,000 feet, then \$5 a hundred to 2,500 feet, then \$6 a hundred to 4,000 feet; for gill nets \$5 for 2,000 feet and \$5 for each additional thousand; for pound net, with leader not exceeding 700 feet, \$5, and for each pound net in excess of one used with one leader, \$5; fyke or hoop net, \$5; bait or turtle nets, \$1; metal tags are 25 cents each (sec. 4836). Fee for inland commercial fishing is 20 per cent of gross receipts plus expenses and compensation of warden (ch. 261 of laws 1915).

Fees for set line (sec. 4836), fishhouse (sec. 4866), tip-up license (sec. 4868), and non-resident pole and line license if fisherman over 21 years old (sec. 4879) are \$1 each.

The commercial mussel fishing fee is \$1 for residents and \$25 for nonresidents, plus in either case \$25, if a dredge is used (ch. 276 of laws 1915).

**Tennessee.**—The fee is \$2 for each net or basket (sec. 49).

**Wisconsin.**—Fishing licenses of Minnesota and Iowa are accepted if those States reciprocate (sec. 62.07).

Licenses are issued only to natural persons (not to corporations) (sec. 62.11).

Fees for nonresidents are as follows: Mussel fishing, \$50 (sec. 62.44); fishing in inland waters if fisherman over 16 years old, \$1 (sec. 62.25); operating gill net in Great Lakes waters with steam vessel having steam lifter, \$200, or without steam lifter, \$100, or with any other vessel not propelled by oars, paddle, or pole, \$50 (sec. 62.34).

Fees for residents or nonresidents in Great Lakes waters are as follows: Pound or gill nets (except as hereinbefore noted), \$2; fyke, drop, or trap nets, trammel net, seine, or set lines, \$1 (sec. 62.34).

Fees for fishing in the Mississippi River and Lakes Pepin and St. Croix are as follows: Seines for first 500 feet \$1 a hundred, second 500 feet \$2 a hundred, third at \$3, fourth at \$4, fifth at \$5, and 2,500 to 4,000 feet at \$6 a hundred; gill nets for first 2,000 feet \$5 and for each additional thousand feet \$5; pound or hoop nets with 700-foot leader and one pound \$5 and for each additional pound \$5; bait nets, \$1 each. For these waters fishermen must give bonds (sec. 62.35).

Metal tags are required for nets and set lines at 25 cents each (sec. 62.34, 62.35, 62.39).

Fees are from \$5 to \$50 for net fishing in specified inland waters (sec. 62.37, 62.38).

Fee for set lines in specified waters is \$1 (sec. 62.39).

## V. SHIPPING AND SELLING FISHERIES PRODUCTS.

**Arkansas.**—Shipping of game fish beyond State line is prohibited (sec. 19).

**Illinois.**—Black bass shall not be sold nor, if taken within the State, pickerel or pike perch (sec. 41). Said fish shall not be shipped, except not over 25 fish, in one lot as baggage (sec. 43, 44). No frogs over a quarter of a pound, or fish shall be shipped April 20 to July 1, inclusive, except whitefish, lake trout, cisco, and yellow perch (sec. 44). Shipments of fish must be marked to show contents and other facts (sec. 43, 45).

**Iowa.**—Game fish shall not be shipped from inland waters for the purpose of sale, and any person shipping game fish must deliver to the carrier a sworn statement (sec. 2). As noted on page 9 hereof, "game" fish is construed to include any food fish that takes a live bait.

**Louisiana.**—Black bass, striped bass, crappie, "white perch" (crappie), "any species of perch," and sunfish shall not be sold (sec. 38). All shipments of fish and shipments without the State of diamond-back terrapin must be marked to show contents and other facts (sec. 41, 62).

**Minnesota.**—The sale or shipping of pike perch from stocked waters, or of brook trout or black bass, is prohibited (sec. 4870, 4871; see also sec. 4876 as to certain counties). Fish shall not be shipped beyond the State except specified rough fish and except not over 50 pounds taken by a nonresident for personal use; packages shall be marked to show contents and other facts (sec. 4875). The commission may prohibit the sale of crappie, yellow perch, or sunfish caught in stocked lakes (sec. 4877).

**Mississippi.**—Boards of supervisors have authority to regulate by whom and in what quantities and to what extent fish may be marketed (sec. 2306).

**Wisconsin.**—Shipments of fish must be marked to show the contents and other facts, and the consignor must be the owner and must deliver to the carrier a statement that he is. (Sec. 62.10, 62.35, 62.37, 62.38.)

Subject only to the preceding, minnows, suckers, carp, redbhorse, fresh-water drum, burbot, bowfin, gar, buffalofish, and lizards may be shipped. Other varieties of fish taken in inland waters may be shipped only as follows: One shipment of lake trout containing not more than 20 pounds may be transported by any person in each period of 7 days when accompanied by the consignor; other varieties of trout may be transported when accompanied by the consignor; of the remaining varieties of fish, one package containing not more than 20 pounds or in lieu thereof not more than 2 fish of any weight may be made in each 7 days; or (without 7-day limit) up to 50 pounds may be transported to a point within the State when accompanied by the consignor (sec. 62.42).

Other restrictions regulate shipments from Green Bay and Fox River: pike perch and pickerel taken from outlying waters; imported pike perch and pickerel in their natural frozen state; and provide that any shipment originating at any other than ports on outlying waters shall be subject to provisions hereinbefore noted as to fish taken in inland waters; and prohibit the transportation of living young of carp or bowfin (sec. 62.42). Transportation of wild animals (includes fish) into this State is forbidden, if shipped from another State in violation of its laws relating to transport (sec. 62.07).

Trout other than lake trout shall not be served at eating places (sec. 62.10).

## VI. MISCELLANEOUS PROVISIONS.

TABLE OF PROVISIONS FOUND IN STATUTES GENERALLY, WITH REFERENCES TO SECTIONS OF PAMPHLET LAWS.

Subject.	Ark.	Ill.	Iowa.	Ky.	La.	Minn.	Miss.	Mo.	Tenn.	Wis.
Ownership of fish, etc., declared in State	Sec. (a)	Sec. 32	Sec. 59, 60	Sec. -----	Sec. 1	Sec. 4778	Sec. -----	Sec. 6508	Sec. 1	Sec. 62.08
Obstructing the passage of fish forbidden					53		2313	6535	48	62.09
Fishways required over dams.	50	49	16	1392A		4772		6552		
Contamination of waters prohibited.					57	4773	3286	6536	51	62.32
Having fish in possession smaller than the legal limit, or during close season, or in excess of bag limit, is declared unlawful or presumed to be unlawful.		42A	6, 26		18, 39	4785, 4786 4808, 4838 4870, 4871 4873				62.07 62.10
Commission or warden to propagate and rescue fish and assist in stocking waters.	6	25, 46	1, 12	3, 9	1, 19, 21 22, 23 49, 51	4758				62.55
Commission may establish fish preserves.		25		8	22, 30					
Reports by licenses required on fish caught or handled.					35, 36	(b)				62.34 62.35
Reports required on catch of mussels.		58				(c)				

a Sec. 15 of act of 1903.

b Sec. 4820 and ch. 261, laws of 1915.

c Ch. 276, laws of 1915.

## PROVISIONS PECULIAR TO THE RESPECTIVE STATES, WITH REFERENCES TO SECTIONS OF PAMPHLET LAWS.

**Arkansas.**—Nonresidents are forbidden to fish, except in one locality with hook and line (sec. 16 of act of 1903).

**Illinois.**—"Objectionable" fish is defined to mean gar and gizzard shad (sec. 51).

**Iowa.**—Cities and towns may prevent the escape of fish from boundary lakes (sec. 17).

**Louisiana.**—Intake pipes for irrigation must be screened to prevent entrance of fish, except on the Mississippi River (sec. 56).

Fish may be had in possession five days after end of open season (sec. 39).

Police juries of each county are authorized to make regulations for the protection of alligators (act 37 of 1908).

The commission may adopt rules and regulations for the comprehensive control of fish (sec. 2, 24, 52); shall assist in protecting private ponds (sec. 2); may prescribe regulations for stocked streams (sec. 23, 51); and may regulate seines, hoop nets and set lines (sec. 42). No spawn or fish from without the State shall be liberated without permission from the commission (sec. 22, 50).

Game and fish preserves are established. (Acts 172 of 1912 and 273 of 1910.)

**Minnesota.**—It is unlawful to have fish in possession if unlawfully taken without the State (sec. 4785). Provision is made for the removal of carp (ch. 348, laws 1915). Counties may screen navigable lakes that have been stocked (sec. 753).

**Wisconsin.**—Waters of State are divided into "outlying" and "inland" and each defined (sec. 62.26). Game fish are declared to be trout, grayling, lake trout, whitefish, crappie, black bass, striped bass, rock bass, pike perch, catfish, muskellunge, sturgeon, and pickerel, in all waters, and yellow perch in certain waters; rough fish are all others (sec. 62.27). Fishermen must permit State officials to remove eggs and milt from fish captured (sec. 62.56).

CONDITION AND EXTENT OF THE NATURAL OYSTER  
BEDS AND BARREN BOTTOMS IN THE VICINITY  
OF APALACHICOLA, FLA.

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By ERNEST DANGLADE

*Scientific Assistant, Bureau of Fisheries*

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Appendix V to the Report of the U. S. Commissioner of Fisheries for 1916.





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# CONDITION AND EXTENT OF THE NATURAL OYSTER BEDS AND BARREN BOTTOMS IN THE VICINITY OF APALACHICOLA, FLA.

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By ERNEST DANGLADE, *Scientific Assistant, Bureau of Fisheries.*

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## INTRODUCTION.

The survey began on January 16, 1915, in the western portion of St. George Sound about 1 mile east of the first oyster bed and was completed April 16 at the western extremity of St. Vincent Sound. The Fisheries steamer *Fish Hawk*, in command of Boatswain J. J. O'Brien, arrived off Apalachicola, Fla., December 21, 1914, and served as the base of operations. The interval from the arrival of the vessel until the beginning of the survey was utilized in recovering triangulation stations established by the United States Coast and Geodetic Survey, constructing signals over these stations, and selecting prominent points for additional and auxiliary signals.

During the progress of the survey 43 signals were built, 3 of which, owing to the low elevation of the shore and the width of Apalachicola Bay, were much larger than any heretofore erected by this Bureau. The signals were anchored and secured by guy lines of telephone wire. Including range beacons, Cape St. George Lighthouse, and other fixed objects, a total of 56 signals were in use. Figure 1 is from a photograph of the signal built on St. Vincent Point.

Permanent cement monuments, in the top of each of which there is a 3-inch brass disk inscribed "U. S. Bureau of Fisheries, 1915," were planted under signals Marsh, Yent, Fet, Cedar, and Schep.

During the early part of the investigation the weather was unfavorable on account of high winds or haze, but there were no violent storms and but few heavy rains. The latter part of the season, especially during the month of April, was almost ideal for both hydrographic work and biological investigations.

Gasoline motor boats were used for the work and proved to be entirely satisfactory for the needs of the party. They were better and more economical than the steam launches employed on previous oyster surveys.

Throughout the survey Boatswain J. J. O'Brien, United States Navy, and Templeton Van de Bogert were the observers. The latter

also did practically all the plotting and made the smooth sheet and chart. The tide-gauge observations were made at Apalachicola by Thomas J. Adams and J. H. Marshall and at the station on St. Vincent Island by Oscar Barrow, all of the *Fish Hawk*. At the remaining stations the readings were made by either civilians or by members of the working party detailed for that purpose. The survey was greatly facilitated by the zeal and interest taken by those engaged in the work.

During the season of 1895-96 the Bureau made a survey of the oyster beds in these waters <sup>a</sup> from Indian Pass to and including Cat Point, Bulkhead, and East Hole Bars.

#### HISTORICAL DATA.

Although no written word is left of their labors, the first persons engaged in the oyster industry in this region were undoubtedly the aborigines. These people were evidently keenly observant of the economic worth of oysters and carried on the fishery quite extensively for a long time, as is indicated by the presence of large quantities of oyster shells in long windrows and piles on the banks. This is particularly noticeable along the north shore of the western half of St. Vincent Sound.

The following brief account of this oyster region, covering a period of 80 years, is based on data kindly furnished by John G. Ruge and others of Apalachicola, Fla., and also from the report of the previous survey.

Oysters were first taken for the local market in 1836, but the industry did not attain much importance until 1850. It continued rather active until the Civil War, when work practically ceased. The beds meanwhile improved and were in very good condition. After the war the oyster business was again taken up, but it was not until 1878 that it was carried on at all extensively. It then continued active for about eight years, when, on January 12, 1886, the greater part of the oysters, owing to a series of low tides, was materially injured by a hard freeze. The reefs, however, recovered and the season of 1890-91 was very productive.

During the winter of 1893-94 the beds of St. Vincent Sound and Apalachicola Bay were nearly destroyed, and for the next two years practically no oysters were taken from these places. Meanwhile Cat Point, Bulkhead, and Porter Bars furnished the greater part of the oysters brought to market.

On October 8, 1894, a heavy gale caused many of the oysters to be covered with sand and mud. Then this was followed by a freeze on December 29 and for several days the temperature fell to 14° F.,

<sup>a</sup> Report of a survey of the oyster regions of St. Vincent Sound, Apalachicola Bay, and St. George Sound, Fla. By Lieut. Franklin Swift, U. S. Navy. Report of the Commissioner for 1896, p. 187-221.

killing many of the oysters that were not protected by sand and mud. On February 7, 1895, the thermometer registered  $10^{\circ}$  F., being the lowest known in that section, it is said, for 60 years. The fishermen could not catch enough oysters the next year to make a living, and consequently the plants operated for only a short time.

Up to this time the shipments of raw oysters were mainly in the shell to local or near-by points, but during this season the first active shipments of shucked raw oysters were made.

Another freeze occurred on January 28, 1897, at a time when the tide was very low. Owing to the exposure many oysters were destroyed and for the season 1896-97 the dealers handled only about one-half the quantity of the usual yield. However, during the following season, although of shorter duration, production was increased, showing that the beds were recovering in productivity.

On August 2, 1898, a severe gale covered some of the oysters with sand and mud, and in September of that year a very heavy freshet occurred, the combined effects being the destruction of many of the oysters at Cat Point and practically all at St. Vincent. On February 12, 1899, there was another freeze, the temperature dropping to  $10^{\circ}$  for a few days, but not for as long duration as in 1895. The operation of the two canneries and the shipments of raw oysters during the season of 1898-99 were nearly equal to those for seasons prior to 1895, thus again showing the great productivity of the bars. The output for 1899-1900 was less than for the preceding season, but there was an increase of about 50 per cent in 1900-1901.

A temperature of  $20^{\circ}$  F., December 16 to 18, 1901, did not result seriously to the oysters, and the output of the canneries and raw shipments for 1901-2 increased, although the season was shorter than the year before. The following year gave about the same returns.

A gale on August 13 and 14, 1903, covered the oysters on Porter Bar with sand and mud, practically destroying them. Cat Point and East Hole Bars were also injured, and St. Vincent Bar, which was regaining its productivity after the disaster of 1898, was covered with sand. The season's operation was very short and the output greatly reduced.

The season of 1904-5 was mostly very favorable. A strike closed one canning plant shortly after it started, but did not interfere with the other. The shipments of raw stock, however, were about as usual, and in the aggregate the output was fully equal to the previous year. There was a temperature of  $22^{\circ}$  F., February, 1905, but as the winds were favorable for high tides the oysters were not affected.

Although a heavy gale on September 27, 1906, covered many oysters with mud and sand, they were able to recover readily and the damage was slight. The yield of the two seasons, 1905-7, was about normal. The total output from all sources for 1907-8 was quite large. During

the first week of May, 1908, there was a very high freshet accompanied by southeast winds, which prevailed for three days, but they were followed by heavy northwest winds, which drove the fresh water to the eastward, without forming mud deposits, leaving the oysters uninjured. A temperature of 22° F. on February 1, 1909, produced no serious results, and about the middle of March of the same year a heavy freshet occurred, but the prevailing winds forced the fresh water out to East Pass, and, fortunately, it was too early in the season to have any effect on the spat.

On September 20 and 21, 1909, a gale occurred which did but little harm at this place, although there was very extensive damage on Mississippi Sound, and on October 11 and 12 there was another storm, but, owing to the direction of the wind, the oyster reefs escaped practically unharmed.

During the second and third weeks of April, 1910, there was a freshet, but the prevailing wind carried the water eastward, so that the deposit of silt was not sufficient to smother the spat.

The yields for the seasons 1910-1914 were equal to the average. For 1913-14 there were gathered 240,436 tubs, or so-called bushels, statistically reported by the Florida State Shell Fish Commissioner as 120,218 barrels.

The season of 1914-15 bid fair to be a good one, but, incident to the European war, there was less demand for steamed oysters or raw material. So for this season the yield was but 144,940 tubs, or 72,470 barrels.

There was a freshet in January, 1915, but little, if any, damage was done.

#### METHODS OF THE SURVEY.

The methods employed were those pursued in former surveys of like character, and are explained in detail in a description of the beds of the James River,<sup>a</sup> from which some of the following is repeated:

A "boat sheet" was prepared, on which were accurately platted the positions, as determined by triangulation, of lighthouses, buildings, tripods, etc., used as signals. These data were furnished by the United States Coast and Geodetic Survey.

The oyster beds were discovered by soundings with a lead line, but principally by means of a length of chain dragged over the bottom at the end of a copper wire running from the sounding boat. The wire was wound on a reel, and its unwound length was adjusted to the depth of water and the speed of the launch, so that the chain was always on the bottom. Whenever the chain touched a shell or an oyster the shock or vibration was transmitted up the wire to the hand

<sup>a</sup> Moore, H. F.: Condition and extent of the oyster beds of James River, Va. Bureau of Fisheries document no. 729.

of a man whose sole duty it was to give heed to such signals and report them to the recorder.

The launches from which the soundings were made were run at a speed between 3 and 4 miles per hour. At intervals of three minutes—in some cases two minutes—the position of the boat was determined by two simultaneous sextant observations of the angles between a set of three signals, the middle one of which was common to the two angles, the position being immediately platted on the boat sheet. At regular intervals of 15 seconds, as measured by a clock under the observation of the recorder, the leadsman made a sounding and reported to the recorder the depth of the water and the character of the bottom, immediately after which the man at the wire reported the character of the chain indications since the last sounding—that is, whether they showed barren bottom or dense, scattering, or very scattering growths of oysters.

With the boat running at 3 miles per hour the soundings were between 60 and 70 feet apart, and, as the speed of the boat was uniform, the location of each was determinable within a yard or two by dividing the platted distance between the positions determined by the sextant by the number of soundings. The chain, of course, gave a continuous indication of the character of the bottom, but the record was made at the regular 15-second intervals observed in sounding.

The chain, while indicating the absence or the relative abundance of objects on the bottom, gives no information as to whether they are shells or oysters, nor, if the latter, their size and condition. To obtain these data it was necessary to supplement the observations already described by others more definite in respect to the desired particulars. Whenever, in the opinion of the officer in charge of the sounding boat, such information was required, a numbered buoy was dropped, the time and number being entered in the sounding book. A launch, which followed the sounding boat, anchored alongside the buoy, and a quantity of the oysters and shells were tonged up, separated by sizes, and counted.

This boat at each station made a known number of "grabs" with the oyster tongs, exercising care to clean the bottom of oysters as thoroughly as possible at each grab. In a given depth of water and using the same boat and tongs, an oysterman will cover practically the same area of the bottom at each grab, but, other factors remaining the same, the area of the grab will decrease with an increase in the depth.

Careful measurements were made and tabulated showing the area per grab covered by the tonger employed on the work at each foot of depth of water and for each pair of tongs and boat used. With these data, and knowing the number of "grabs," the number of

oysters of each size per square yard of bottom was readily obtainable by simple calculation. The following example will illustrate the data obtained and the form of the record:

## DEPARTMENT OF COMMERCE.

## BUREAU OF FISHERIES.

*Field record of examinations of oyster beds.*

Serial number, 1001. General locality, *Apalachicola Bay*.

Local name of oyster ground, *St. Vincent Bar*.

Date, *March 25, 1915.*

Angle, *K 69-70.*

Depth, *4 feet.*

Bottom soundings, —

Density, —

Condition of water, *Clear.*

Tongman, *Meyer.*

Number grabs made, *8.*

Total area covered, *3.05* square yards.

Number oysters taken { — 1 in., *0.*  
X in.—4 in., *35.*

Quantity shells, *32.*

Result { Spat per square yard, *0.*

{ Culls per square yard, *6.9.*

{ Counts per square yard, *17.1.*

X in.=cull limit prescribed by law.

Time, *3.15 p. m.*

Buoy No. *7.*

Bottom, *Hard.*

Average, —

Temperature, —

Stage of tide, *Ebb.*

Boat, *No. 2.*

Tongs, *12 C.*

1 in.—X in., *21.*

4 in., *17.*

Dead, *5.*

This furnishes an exact statement of the condition of the bed at the spot, which can be platted on the chart with error in position of not more than a few yards. From the data obtained a close estimate may be formed of the number of bushels of oysters and shells per acre in the vicinity of the examination, and, by multiplying the observations, for the bed as a whole. In the course of the survey 1,306 observations were made at various places, both on the natural rocks and on the barren bottoms.

In estimating the productiveness of the bottoms it appeared desirable to use the method employed in Delaware Bay<sup>a</sup> rather than that followed in the James River survey.

Where tongs are used exclusively a bed with a given quantity of oysters lying in shoal water is more valuable commercially than one with the same quantity of oysters in deeper water, owing to the fact that the labor of the tonger is more efficient on the former. As has been pointed out, the area covered by a "grab" decreases with the depth, other factors being the same; and, moreover, the deeper the water the greater is the labor involved in making the grab and the smaller is the number of grabs which can be made in a given time. Where, however, the depth is practically uniform and shoal, as in

<sup>a</sup> Moore, H. F.: Condition and extent of the natural oyster beds of Delaware. Bureau of Fisheries document no. 745, 1911.



the region treated in this report, it is unnecessarily refined and laborious to make such allowance for depth, and it is nearly as accurate and satisfactory to rate the bottoms in accordance with an arbitrary standard.

In this report the classification of the relative productiveness of the various beds and parts of beds, as exhibited on the chart and discussed in the text, is as follows:

Dense growth.....	Bearing over 150 bushels per acre.
Scattering growth.....	Bearing between 75 and 150 bushels per acre.
Very scattering growth.....	Bearing between 25 and 75 bushels per acre.
Depleted bottom.....	Bearing less than 25 bushels per acre.

This classification refers solely to oysters of a size assumed to be large enough for the market, in this case to those 3 inches or more in length. As the classification takes no account of the smaller oysters, certain areas bearing a heavy growth of young may be described and shown on the charts as depleted, owing to the paucity of mature oysters. While the charts can not indicate this, the descriptions of the beds show it in all cases. The charts show in general terms the character of the beds in respect to the product available for market, so far as mere size of the oysters is concerned, at the time of the survey. If the oysters were of ordinarily good condition and shape, the areas indicated as bearing dense and scattering growth would yield a product sufficient to make tonging remunerative under the economic conditions existing. Where the market oysters are rated as very scattering, the growth is insufficient to support a fishery at the low price which the product would yield. The depleted bottom is that on which the product of market oysters, at the time of the survey, was very small, and is not necessarily formerly productive bottom now denuded, as might be supposed from a strict definition of the descriptive term employed. On the contrary, it may be formerly barren bottom now coming into production.

The barren bottom, which is that totally devoid of oysters, and in most cases of shells, vastly exceeds the oyster bottom in extent. Its interest in connection with the survey lies in its relative availability for oyster culture; that is, whether or not its general character is such as to enable it to become productive if proper measures to that end be taken. The most important consideration is, usually, the character and degree of stability of its constituent materials. If the bottom be too soft, the shells and oysters deposited thereon will soon become engulfed.

In the earlier surveys the method ordinarily used by oystermen was employed, the consistency of the bottom being determined by probing with a pole. By noting the resistance which the bottom imposes to the penetration of the probe, the observer forms an opinion of its relative hardness and of its suitability in that respect for oyster

culture. In many cases different observers will not agree as to the proper term by which to describe the bottom so tested, and it is therefore difficult to convey to another the meaning desired. To overcome this difficulty an instrument <sup>a</sup> has been devised which gives these data mechanically, by measuring the number of inches the bottom is penetrated by a plunger of a constant weight and size falling through a uniform distance. The instrument is used from an anchored boat, from 6 to 10 tests being made at each station. Any readings which are markedly higher or lower than the others are discarded on the assumption that the plunger has fallen into a crab hole or other depression, or that it has encountered a shell or similar accidental obstruction. The average of the remaining depths of penetration, as indicated on the scale of inches inscribed on the rod, is regarded as the measure of the consistency of the bottom.

The following designations used to indicate the different degrees of hardness, as shown by the instrument, are arbitrary, although based on the terms used by the oyster growers:

Hard.....	Penetration less than 4 inches.
Stiff.....	Penetration between 4 and 8 inches.
Soft.....	Penetration between 8 and 13 inches.
Very soft.....	Penetration between 13 and 18 inches.
Ooze.....	Penetration over 18 inches.

These various types of bottom are shown on the chart by means of circles, the relative area of black included within them indicating the relative degree of hardness, as follows: Hard, a black circle; stiff, a black semicircle; soft, a black quadrant; very soft, two crossing diameters; ooze, one diameter.

The bottoms classed as hard and stiff, those in which the plunger will not penetrate more than 8 inches, are suitable for planting without preparation, provided they are not composed of shifting sand. As sand invariably gives a reading of less than 4 inches, and is therefore rated as "hard," it follows that all "stiff" bottom shown on the chart by a black semicircle can be accepted as safe for planting. Part of the hard bottom is composed of mud and part of sand. The former may be accepted without hesitation, but the latter should be examined with respect to its liability to shift. Soft bottom should be planted with care, and toward its upper or less consistent limits may require some preliminary hardening with shells or sand. Very soft bottom and ooze should not be considered, as oysters planted there will sink, and if not killed, as is probable, will be ill-shaped and inferior in every respect. The ratings on which the classification is based have been checked by observation on bottoms actually used for oyster culture in Chesapeake Bay.

<sup>a</sup> Illustrated and described in "Condition and extent of the natural oyster beds and barren bottoms of Mississippi Sound, Alabama." By H. F. Moore. Bureau of Fisheries document no. 769.

The instrument employed has been thoroughly tested and is reliable for the purposes of oyster surveys, but there may be errors in cases where hard bottom is overlaid by several inches of soft mud and ooze. Such bottoms are always readily detected by probing with a pole.

#### THE BAY AND SOUNDS.

The oyster grounds and barren bottoms covered by the present survey and reported on in this paper embrace all of Apalachicola Bay and St. Vincent Sound and the western part of St. George Sound. Neither East Bay, with the exception of its southern border, nor Indian Lagoon at the extreme western limits of St. Vincent Sound were included in the work. Although bearing some good oysters, they were not deemed of sufficient economic importance to warrant the expenditure of the time and money. Sheephead and Big Bayous on the northern shore of St. Vincent Island have some good oyster growths, but as these were within the confines of the island they were not examined.

St. George Sound lies within the southern limits of Franklin County, Fla., and is situated between the mainland and St. James Island on the north and east and St. George and Dog Islands and Dog Island Reef on the south. It connects with the Gulf of Mexico at East Pass, Duer Channel, and the shallow water on Dog Island Reef. On the west it unites with Apalachicola Bay on a line between Cat Point and St. George Island. Its length is about 26 miles, and it has an average width of about  $3\frac{1}{2}$  miles. Carrabelle River is the only stream flowing into the sound. As only the western portion of the sound supports productive oyster beds, the survey was conducted westward from signals Marsh and Spartan. This part of the sound has an area of about 34 square miles and measures about 7 by  $4\frac{1}{2}$  miles and carries about 9 feet at low water. It contains many bars and shoals but is well buoyed for navigation.

Apalachicola Bay is bounded on the north by the mainland and East Bay, on the east by St. George Sound, on the south by St. George Island, and on the west by St. Vincent Island and Sound. Its length is about 14 miles and the greatest width about 7 miles. The direct connection with the Gulf is through West Pass. There are three dredged channels, one through Bulkhead to St. George Sound, one near West Pass, and one in the vicinity of Apalachicola, which afford depths for moderate-draft vessels. The bay receives the waters from the Apalachicola, St. Marks River, and other affluents of East Bay. The greater part of the oyster bars are located in the western portion of the bay; elsewhere the bottom is generally barren and soft.

St. Vincent Sound, a rather shallow body of water, is the western extension of Apalachicola Bay. Beginning with the line between Green and St. Vincent Points it reaches to Indian Pass, a distance of, approximately,  $9\frac{1}{2}$  miles. Its width at the eastern end is about 3 miles, and it gradually tapers toward the west until it is about three-fourths mile in width. It has an approximate area of 18 square miles. With the exception of the shallow water along the shore, the eastern third of the sound generally has a soft bottom; the central section contains the greater number of oyster bars; while the western section though practically devoid of large oyster bars, has a hard or shell-gravel bottom. The sound receives no fresh water other than the surface drainage of the adjacent lands and that coming indirectly from the Apalachicola, St. Marks, and other affluents of East Bay.

The greatest depth recorded in St. George Sound was 35 feet; in Apalachicola Bay 13 feet, excepting in dredged channels; in St. Vincent Sound 33 feet; West Pass 55 feet; and Indian Pass 20 feet. On the bar beyond Indian Pass a depth of  $6\frac{1}{2}$  feet was found.

The area surveyed embraces, approximately, 130 square miles, of which about 119 square miles consisted of barren bottoms and 11.1 square miles comprised the oyster bars and reefs. The total length of the sounds and bay is about 30 miles and the average width about 4.4 miles.

During the progress of the survey 35,549 soundings were made over a distance of 666.1 miles, and 3,492 sextant angles determined the various positions of the boat. Observations by means of the chain were made constantly throughout the entire distance run by the sounding boat, the oysters were tonged up, examined, and counted at 577 places, and the barren bottoms were tested at 729 stations.

#### DESCRIPTION OF NATURAL BEDS.

##### 1. GOOSE ISLAND BAR (ST. GEORGE SOUND).

This, the easternmost oyster bar of St. George Sound, is located along the southern border of the sound in the vicinity of Goose Island. Its length, in an east and west direction, is about 1 mile, the average width is nearly one-fourth mile, and the area is about 150 acres. It is directly connected with Silvia Bar by a narrow neck of dense oysters having a width of approximately 150 yards.

The bar lies in rather shallow water, ranging from  $2\frac{1}{2}$  to  $5\frac{1}{2}$  feet in depth, and, with the exception of both the east and west extremities, is but slightly elevated above the general level of the sound. The bottom, for the most part, is composed of firm hard sand. The area, condition of growth, and estimated content of this bar are shown in the following tables:

## OYSTER GROWTH ON GOOSE ISLAND BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	<i>Acres.</i> 24	<i>Bushels.</i> 115	<i>Bushels.</i> 358	<i>Bushels.</i> 473	<i>Bushels.</i> 11,352
Very scattering.....	126	24	58	82	10,332
Total.....	150				21,684

## DETAILS OF EXAMINATION OF GOOSE ISLAND BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
65.....	Jan. 23	3.0	2.94	0	4.8	12.4	10	41	286	327	Dense.
87.....	do.....	5.5	1.87	6.4	12.3	16.5	15	159	382	541	Do.
373.....	Feb. 11	5.0	2.55	0	17.2	17.6	10	146	406	552	Do.
41.....	Jan. 21	2.0	3.56	.3	2.5	2.5	2	24	58	82	Very scattering.

That portion of the bar immediately contiguous to Goose Island, and containing about five-sixths of the total area, has but a scattering growth of oysters, while the remaining portion, which lies to the extreme west, has a dense growth. The oysters occur generally in large clusters, with sharp edges. Mussels were only fairly abundant, but the greatest disadvantage to the growth of oysters was the presence of both red and green algæ, which at times was in quantities sufficient to smother the oysters. Tonging was not carried on extensively, especially on the very scattering area, and during our observations only one or two boats were engaged in the fishery on the dense portion.

## 2. SILVIA BAR.

This comparatively small bed of 69 acres is directly connected with Goose Island bed on the east and Drum Bar on the southeast. There are, however, no distinct lines of demarcation separating the three beds, the divisions being more or less arbitrarily made. The bed is very irregular in shape, the northernmost half consisting of a projecting point bearing a crude resemblance in outline to a turtle's head. Its length is about five-eighths of a mile and the average width approaches 200 yards. The depth of water is from  $2\frac{1}{2}$  to 9 feet, while the bed is elevated above the immediate level from  $1\frac{1}{2}$  to 8 feet, the greatest difference being along the western border, which is near the ship channel. The bottom consists of sand or sand and mud.

The bed is composed of dense, scattering, and very scattering growths, as shown in the following tables:

OYSTER GROWTH ON SILVIA BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	57	136	337	473	26,961
Scattering.....	4	165	104	269	1,076
Very scattering.....	8	4	67	71	568
Total.....	69				28,605

DETAILS OF EXAMINATION OF SILVIA BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
77.....	Jan. 23	7.5	1.55	20.0	13.5	20.0	4	285	463	748	Dense.
78.....	do.....	9.0	1.55	5.1	13.9	22.5	17	161	520	681	Do.
79.....	do.....	8.5	1.55	2.9	3.8	4.5	4	57	104	161	Do.
80.....	do.....	3.5	2.70	6.3	5.9	8.1	25	104	187	291	Do.
81.....	do.....	6.0	1.75	3.4	17.3	20.6	30	176	475	651	Do.
372.....	Feb. 11	8.0	2.04	1.4	3.9	11.7	10	33	270	303	Do.
91.....	Jan. 23	7.0	1.55	9.7	9.7	4.5	24	165	104	269	Scattering.
371.....	Feb. 11	10.0	2.04	1.4	0.5	2.9	5	4	67	71	Very scattering.

The oysters of this bar occur in clusters of rather good shape, excepting a few of the raccoon or scissor-bill type on the top of the bar. Some algæ, a few mussels, barnacles, *Martesia*, and coral were observed at nearly all of the stations. The oysters, on the day of the examination, were generally of good flavor and fat, more especially on the western and southwestern limits of the bed.

## 3. DRUM BAR.

This bar may be considered as the southward extension of Silvia Bar, with which it is connected. It forms a somewhat irregular half circle in outline. The depth of water on the bed varies from  $2\frac{1}{2}$  to 9 feet. The elevation above the surrounding bottoms is from 1 to 3 feet. The dimensions are approximately 1 mile in length by 350 yards in width. The area is 111 acres, of which about 73 per cent supports dense growth, the remainder being depleted. The bottom is generally hard, excepting along the southern border, where it is composed of mud or mud and sand. The extent and general condition of the bed are shown in the following tables:

## OYSTER GROWTH ON DRUM BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	<i>Acres.</i> 81	<i>Bushels.</i> 108	<i>Bushels.</i> 336	<i>Bushels.</i> 444	<i>Bushels.</i> 35,964
Depleted.....	30	32	12	44	1,320
Total.....	111				37,284

## DETAILS OF EXAMINATION OF DRUM BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
68.....	Jan. 23	5.0	2.00	1.5	9.5	20.0	13	81	462	543	Dense.
73.....	do.	9.0	1.55	9.3	11.9	33.1	54	180	774	954	Do.
76.....	do.	9.5	1.55	8.7	8.1	6.8	12	143	157	300	Do.
84.....	do.	7.5	1.55	1.9	14.8	9.0	10	142	208	350	Do.
85.....	do.	8.0	1.55	2.6	4.5	5.1	8	60	118	178	Do.
86.....	do.	5.0	2.00	1.5	13.0	11.5	28	123	265	388	Do.
366.....	Feb. 11	8.0	2.04	2.5	10.8	23.1	15	92	533	625	Do.
367.....	do.	6.5	2.12	5.6	10.4	10.8	9	88	250	338	Do.
368.....	do.	5.0	2.55	.4	16.1	21.2	21	137	490	627	Do.
369.....	do.	5.5	2.38	1.2	3.4	4.6	9	29	106	135	Do.
74.....	Jan. 23	11.0	1.55	0	7.5	0	4	64	0	64	Depleted.
370.....	Feb. 11	7.0	2.04	0	0	1.0	3	0	23	23	Do.

The oysters are found in large irregular clusters with sharp edges, but occasionally they are taken as singles. On the upper half of the bar they are of rather good quality, but on the lower portion they are inclined to be watery and in poor condition, more particularly on the softer bottoms, where they are but seldom fished. A number of barnacles, mussels, and an extensive growth of algæ were observed on the oysters.

## 4. SAND FLAT.

This beach bed is situated off Shell Point of St. George Island and is south of Drum Bar and separated from it by a narrow channel having a depth of 5 to 7 feet. It measures about one-half mile in length by one-eighth mile in width and has an area of 40 acres. The depth of water ranges from  $1\frac{1}{2}$  to 5 feet. The bottom is hard firm sand. The northern rim of the bed is about 2 feet above the adjacent bottoms, while the southern portion becomes gradually shallower to the water's edge. The tables given herewith present in outline the general conditions on this bed:

## OYSTER GROWTH ON SAND FLAT.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	20	77	231	308	6,160
Scattering.....	20	77	115	192	3,840
Total.....	40	-----	-----	-----	10,000

## DETAILS OF EXAMINATION OF SAND FLAT.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
83.....	Jan. 23	5.0	2.00	0	9.0	10.0	2	77	231	308	Dense.
75.....	do.....	4.5	2.23	1.4	7.7	5.0	12	77	115	192	Scattering.

The northeastern half of the bar supports dense growth of oysters, the remaining portion being scattering. Practically no fishing is carried on at this place, as beach oysters usually lack flavor and fatness. No doubt the character of the mollusks would be improved if the clusters were broken up and culled. Some mussels, barnacles, and marine algæ were found growing on the oysters.

## 5. PELICAN BAR.

This bar is located about three-eighths mile north of Goose Island and, exclusive of the eastern projection, is somewhat rudely circular in outline. The depth of water is from  $1\frac{1}{2}$  to  $5\frac{1}{2}$  feet, the greatest depth being along the western margin. The bar extends in an east-and-west direction for five-eighths mile and averages about one-fourth mile in width. It has an area of 97 acres. The entire bed is fairly well raised above the neighboring bottoms from  $\frac{1}{2}$  to  $3\frac{1}{2}$  feet. The following tables show the data obtained from this bed:

## OYSTER GROWTH ON PELICAN BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	69	97	453	550	37,950
Scattering.....	17	106	130	236	4,012
Very scattering.....	6	30	46	76	456
Depleted.....	5	19	21	40	200
Total.....	97	-----	-----	-----	42,618



## DETAILS OF EXAMINATION OF PELICAN BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
59.....	Jan. 23	3.0	2.95	0	1.7	22.7	1	14	524	538	Dense.
60.....	do.	5.0	2.00	0.5	8.0	23.0	15	72	531	603	Do.
61.....	do.	4.5	2.23	0	3.1	23.1	7	26	533	559	Do.
62.....	do.	5.0	2.00	.5	16.5	25.0	25	145	577	722	Do.
89.....	do.	6.0	1.75	0	6.8	6.8	14	58	157	215	Do.
90.....	do.	7.5	1.55	3.2	25.8	22.6	20	246	522	768	Do.
108.....	Jan. 25	3.0	2.95	.3	13.9	14.3	3	118	330	448	Do.
88.....	Jan. 23	6.0	1.75	6.8	12.0	5.7	9	160	132	292	Scattering.
107.....	Jan. 25	5.0	2.00	1.0	6.0	5.5	5	51	127	178	Do.
42.....	Jan. 21	5.0	2.00	.5	3.0	2.0	2	30	46	76	Very scattering.
58.....	Jan. 23	4.5	2.23	5.3	2.2	.9	9	19	21	40	Depleted.

The greater part of the bar has dense growth of oysters, a portion of the southern and western borders has scattering growth, while to the eastward very scattering and depleted areas are found. The oysters occur in rather large clusters and, as a rule, are only of fair quality. The bed is not extensively fished, although some factory stock is taken. Mussels and barnacles were not excessive, but some of our stations revealed an extra heavy growth of algæ.

## 6. NORTH LUMP.

This small patch of 10 acres is situated about 600 yards due north of Pelican Bar and a short distance south of the center of the sound. It is cordate, or trilobe, in form, measuring about 300 yards in length and 160 yards in width. At mean low water the depth is from 4 to 11 feet, the greatest depth being on the south and west central portions. The adjoining bottoms, which are composed of soft to stiff mud, have a depth of 11 to 14 feet. The following tables show the area of the different growths and details of examination of this bed:

## OYSTER GROWTH ON NORTH LUMP.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Scattering.....	<i>Acres.</i> 5	<i>Bushels.</i> 81	<i>Bushels.</i> 145	<i>Bushels.</i> 226	<i>Bushels.</i> 1,130
Depleted.....	5	7	-----	7	35
Total.....	10	-----	-----	-----	1,165

## DETAILS OF EXAMINATION OF NORTH LUMP.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
111.....	Jan. 25	11.5	1.55	1.3	10.9	7.1	1	93	164	257	Scattering.
116.....	do.	6.0	1.75	0	9.1	8.0	2	77	185	262	Do.
110.....	do.	5.0	2.00	2.0	11.0	5.5	4	93	127	220	Do.
112.....	do.	7.5	1.55	0	7.1	4.5	15	60	104	164	Do.
109.....	do.	9.0	1.55	0	2.6	0	13	22	0	22	Depleted.
113.....	do.	a 12.0									Do.
114.....	do.	8.0	1.55	0	.6	0	20	5	0	5	Do.
115.....	do.	a 13.5									Do.

a Hard bottom.

The oysters are in sharp-edged clusters of good shape, and when examined were in good condition and flavor, but fresh. It was stated that two men could tong 20 barrels in one and one-half days.

## 7. GREEN POINT BAR AND ADJACENT PATCH.

Green Point Bar is situated about  $1\frac{1}{2}$  miles off the main shore of the sound and about the same distance north of North Lump. Its dimensions are about five-eighths mile in length by one-eighth mile in width. Including the adjacent patch 300 yards to the north, the area is approximately 57 acres. The bar is well raised above the contiguous bottoms and has a depth of 3 to  $5\frac{1}{2}$  feet at mean low water. The upper limits of the bar have very scattering growth, the central portion is dense, while the lower third has dense, scattering, and depleted areas. The small patch has very scattering growth and depleted bottoms.

The oysters occur in small clusters or singles of fair shape, and when examined were fat, of good flavor, but fresh. Red and green algæ and *Martesia* were noted. The bed is fished for raw stock, but not extensively.

The general conditions on the bar and patch are shown in the following tables:

## OYSTER GROWTH ON GREEN POINT BAR AND ADJACENT PATCH.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	21	106	194	300	6,300
Scattering.....	9	24	132	156	1,404
Very scattering.....	17	21	67	88	1,496
Depleted.....	10	21	20	41	410
Total.....	57				9,610

## DETAILS OF EXAMINATION OF GREEN POINT BAR AND ADJACENT PATCH.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
96.....	Jan. 25	6.5	1.62	10.3	9.7	7.9	16	170	183	353	Dense.
98.....	do.	5.0	2.00	5.5	5.0	8.0	36	89	185	274	Do.
99.....	do.	4.0	2.46	2.4	4.4	9.3	6	58	215	273	Do.
97.....	do.	4.0	2.46	1.6	1.2	5.7	10	24	132	156	Scattering.
35.....	Jan. 21	6.0	1.75	0	2.3	3.1	18	19	72	91	Very scattering.
101.....	Jan. 25	7.0	1.55	5.7	2.7	2.7	8	23	62	85	Do.
29.....	Jan. 21	8.0									Depleted.
37.....	do.	6.0									Do.
31.....	do.	7.0									Do.
46.....	Jan. 23	6.0	1.75	1.1	1.1	1.7	5	19	39	58	Do.
95.....	Jan. 25	8.0	1.55	1.3	1.3	0	4	22	0		Do.

## 8. PLATFORM BAR.

This long narrow bar is located a little south of the center of the sound, and extends from Porter Light west by north for three-quarters of its length, thence the trend is due north. Its dimensions are, approximately,  $2\frac{1}{4}$  miles in length by one-fourth mile in width. Its area is about 339 acres. The bar has a depth of water ranging from 3 to 7 feet and is elevated above the contiguous bottoms from 1 to 20 feet, the greatest difference abutting the channel in the vicinity of the light at the eastern extremity. The bottom is generally firm and consists of mud and sand, although the margins are occasionally found to be rather soft. Over 60 biological stations were made, the results of which are given in the following tables:

## OYSTER GROWTH ON PLATFORM BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	332	111	671	782	259,624
Very scattering.....	5	0	18	18	90
Depleted.....	2	0	0	0	0
Total.....	339				259,714

## DETAILS OF EXAMINATION OF PLATFORM BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
70.....	Jan. 23	5.0	2.00	1.5	11.5	11.0	46	111	254	365	Dense.
71.....	do.	5.0	2.00	1.0	11.5	5.5	46	107	127	234	Do.
173.....	Jan. 28	7.0	2.04	0	12.8	31.9	3	109	736	854	Do.
174.....	do.	6.0	2.21	0	9.9	19.9	4	84	460	544	Do.
175.....	do.	5.0	2.55	8.6	22.7	37.7	3	193	856	1,049	Do.
177.....	Jan. 30	7.5	2.04	0	39.8	34.4	6	338	786	1,124	Do.
184.....	do.	3.0	3.65	0	11.8	15.6	7	100	360	460	Do.
185.....	do.	4.0	3.05	0	5.5	18.0	8	47	415	462	Do.
186.....	do.	5.0	2.55	8	22.3	33.4	4	189	773	962	Do.
187.....	do.	6.0	2.21	2.7	20.4	39.9	7	173	922	1,095	Do.
199.....	do.	6.0	2.21	1.8	15.4	29.4	7	131	679	810	Do.
200.....	do.	5.0	2.55	.8	12.2	26.8	8	104	618	722 <sup>a</sup>	Do.
201.....	do.	5.0	2.55	.4	21.2	30.9	7	180	714	894	Do.
202.....	do.	5.0	2.55	0	11.8	22.4	8	100	515	615	Do.
204.....	do.	4.0	3.05	0	11.8	11.4	5	100	332	432	Do.
205.....	do.	4.5	2.75	3.3	16.0	60.7	15	136	1,402	1,538	Do.
206.....	do.	6.5	2.12	2.9	8.1	25.2	5	69	582	651	Do.
207.....	do.	7.0	2.04	0	13.7	27.0	3	116	624	740	Do.
208.....	do.	8.0	2.04	0	3.9	2.9	2	33	67	100	Do.
209.....	do.	8.5	2.04	0	14.7	13.2	5	125	305	430	Do.
210.....	do.	6.5	2.12	0	21.4	41.5	4	182	959	1,141	Do.
218.....	Feb. 2	9.0	2.04	0	13.8	17.2	1	117	397	514	Do.
219.....	do.	9.0	2.04	.5	3.9	8.8	5	33	203	236	Do.
220.....	do.	7.0	2.04	2.9	14.7	25.5	7	125	589	714	Do.
221.....	do.	5.0	2.55	.4	15.3	14.5	5	130	335	465	Do.
222.....	do.	3.5	3.35	4.5	16.1	21.5	6	137	496	633	Do.
223.....	do.	5.5	2.38	1.3	19.7	34.0	2	167	785	952	Do.
224.....	do.	5.0	2.55	.8	22.7	35.3	13	193	816	1,009	Do.
225.....	do.	5.0	2.55	0	31.3	64.2	6	266	1,483	1,749	Do.
226.....	do.	5.0	2.55	1.6	13.3	21.2	7	118	564	682	Do.
374.....	Feb. 11	5.0	2.55	0	3.1	9.4	7	26	217	243	Do.
375.....	do.	5.0	2.55	0	17.2	32.2	12	146	744	890	Do.
377.....	do.	6.0	2.21	0	21.2	58.7	7	180	1,355	1,535	Do.
378.....	do.	5.5	2.38	0	16.4	56.3	10	139	1,301	1,440	Do.
379.....	do.	4.5	2.80	0	10.7	33.2	8	91	766	857	Do.
380.....	do.	6.5	2.12	0	14.2	44.3	6	121	1,025	1,046	Do.
381.....	do.	5.5	2.38	.4	10.9	37.4	6	94	864	958	Do.
382.....	do.	5.0	2.55	0	10.2	27.4	10	87	634	721	Do.
383.....	do.	4.0	3.05	0	6.2	14.4	8	53	332	385	Do.
384.....	do.	5.0	2.55	0	14.5	23.2	30	123	535	658	Do.
385.....	do.	7.0	2.04	0	23.1	66.7	8	196	1,541	1,737	Do.
386.....	do.	6.0	2.21	0	10.0	31.2	9	85	721	806	Do.
387.....	do.	4.0	3.05	0	10.7	14.4	11	91	332	423	Do.
388.....	do.	4.0	3.05	0	7.2	27.8	6	61	642	703	Do.
389.....	do.	6.0	2.21	.9	13.1	44.3	9	111	1,025	1,136	Do.
392.....	do.	8.0	2.04	0	6.4	29.4	5	54	680	734	Do.
393.....	do.	7.0	2.04	0	7.3	35.8	6	62	827	889	Do.
394.....	do.	4.5	2.80	0	10.7	33.5	6	91	774	865	Do.
395.....	do.	4.5	2.80	0	11.0	29.6	7	85	684	777	Do.
396.....	do.	4.5	2.80	0	12.1	18.2	6	103	420	523	Do.
397.....	do.	5.0	2.55	0	15.3	41.6	7	130	962	1,092	Do.
398.....	do.	5.0	2.55	0	16.8	40.3	12	143	925	1,068	Do.
399.....	do.	8.5	(a)	0							Do.
401.....	do.	4.5	2.80	0	10.7	39.3	3	91	907	998	Do.
402.....	do.	6.0	2.21	0	9.5	26.2	6	81	605	686	Do.
403.....	do.	7.0	2.04	0	7.3	21.1	11	62	486	548	Do.
405.....	do.	5.0	2.55	1.2	6.7	25.5	10	57	581	638	Do.
406.....	do.	5.0	2.55	0	19.6	58.8	10	167	1,358	1,525	Do.
407.....	do.	7.0	2.04	.5	9.8	43.6	4	83	1,008	1,091	Do.
408.....	do.	7.0	2.04	2.5	10.8	45.1	16	92	1,040	1,132	Do.
409.....	do.	9.0	2.04	0	4.4	28.4	3	37	655	692	Do.
400.....	do.	8.0	2.04	0	0	3.4	1	0	78	78	Do.
404.....	do.	9.0	2.04	0	0	4.4	2	0	101	101	Do.
390.....	do.	8.0	2.04	0	0	1.5	2	0	35	35	Very scattering.
391.....	do.	9.0	(b)								Do.
376.....	do.	9.5	(a)								Depleted.

<sup>a</sup> Hard bottom.<sup>b</sup> Hard mud and sand.

The entire bar, with the exception of two small tracts totaling 7 acres and a mud hole of about 5 acres northwest of the light, supports dense growth of oysters. For the most part, the oysters occur in large, irregular clusters, and are inclined to be flattish and, at times, of the scissor-bill type. The quality varies from poor to fair, and during the examination they were fresh and rather watery. It appears that the bed is not worked enough to break up the clusters to obtain the best results. The fishery is pursued chiefly for steam stock. The daily yield is from 15 to 25 tubs for two men; price, about 35 cents per tub. Mussels and barnacles were not plentiful, but on some of the stations an abundance of algæ occurred on the clusters. One rather large drill was found, but no injured oysters having drill holes were observed.

#### 9. PORTER BAR.

This fine bed, slightly more than 1 mile north of Platform Bar, consists of a tongue-like projection, which, from its origin of a skirting of oysters along the main shore, reaches in a southeasterly direction for a distance of  $2\frac{1}{4}$  miles. It is about 320 yards wide and has an area of 260 acres. The depth of water is from 2 to 6 feet, while the adjoining grounds are from 2 to 7 feet deeper. The bed is, therefore, well elevated, and, as the tide ebbs and flows almost at right angles to its length, the oysters are generally kept clean and are furnished with an abundance of food material. The bar has a firm foundation and for the most part is sand or gravel, although some of our stations revealed considerable mud. The following tables indicate its area and distribution of oyster growth:

OYSTER GROWTH ON PORTER BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	114	94	248	342	38,988
Scattering.....	9	53	114	167	1,503
Very scattering.....	25	12	47	59	1,475
Depleted.....	112	27	25	52	5,824
Total.....	260				47,790

## DETAILS OF EXAMINATION OF PORTER BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
117....	Jan. 25	8.5	1.55	0	5.1	9.0	1	43	208	251	Dense.
118....	do	6.0	1.75	0	20.6	12.6	7	175	291	466	Do.
119....	do	8.5	1.55	0	3.8	4.5	10	32	104	136	Do.
120....	do	7.0	1.55	7.6	15.9	10.8	20	135	249	384	Do.
124....	do	4.5	2.23	1.8	10.8	7.1	3	92	164	256	Do.
127....	do	6.5	1.62	3.2	5.3	10.7	6	45	247	292	Do.
128....	do	6.0	1.75	4.0	10.8	18.8	4	92	434	526	Do.
131....	do	5.5	1.87	.5	11.2	14.9	4	95	344	439	Do.
132....	do	3.5	2.70	2.9	6.3	6.7	10	54	154	208	Do.
134....	do	6.5	1.62	6.6	7.3	13.9	4	62	321	383	Do.
135....	do	4.5	2.23	2.6	11.5	9.3	5	98	215	313	Do.
140....	do	5.5	1.87	8.0	19.8	9.1	14	168	210	378	Do.
142....	do	6.0	1.75	9.1	16.0	12.0	3	136	277	413	Do.
123....	do	6.5	1.62	1.8	9.7	4.3	11	82	99	181	Scattering.
125....	do	7.0	1.55	1.9	6.4	5.7	3	54	132	186	Do.
143....	do	4.5	2.23	2.6	2.6	4.8	3	22	111	133	Do.
121....	do	6.5	1.62	0	1.8	2.4	9	9	55	64	Very scattering.
122....	do	9.0	1.55	1.9	1.3	1.9	7	9	44	53	Do.
133 <sup>a</sup> ....	do	7.5	1.55	0	1.3	1.3	1	9	30	39	Do.
141....	do	4.5	2.23	3.5	2.2	2.6	9	19	60	79	Do.
129....	Jan. 25	8.0	1.55	0	1.4	0	3	12	0	12	Depleted.
136....	do	5.0	2.00	2.5	2.0	1.0	3	17	23	40	Do.
137....	do	7.5	1.55	5.7	3.1	1.9	3	26	25	51	Do.
138....	do	7.0	1.55	4.4	1.9	1.3	2	16	24	40	Do.
139....	do	5.5	1.87	.5	.5	1.6	6	4	25	29	Do.
144....	do	3.5	2.70	3.3	5.8	1.8	12	49	25	74	Do.
166....	Jan. 28	4.0	3.05	4.9	7.5	1.6	6	64	25	89	Do.
167....	do	3.0	3.65	.3	3.3	2.5	3	28	58	86	Do.

<sup>a</sup> Off edge of bar.

The dense and depleted areas occupy about 43 per cent each of the entire bar, the remaining portions being populated by scattering or very scattering growth. The oysters, which occur both in clusters and as singles, are of good shape and size. At the time of the investigation they were fat, of good quality, and in demand. They hold their flavor after being shucked, command a higher price per tub than the product of the neighboring beds, and are considered to be the best grade in St. George Sound. From three to five schooners were engaged in the industry on this bar. But very few mussels, barnacles, or coral were noted, although there was some algæ along the inner limits of the bar.

The shape of this bed and its position in the sound subject it adversely, more than otherwise would happen, to the occasional violent storms and render it liable to almost complete destruction. Conditions of this kind have occurred, and it required some years to reestablish its former productiveness.

## 10. PEANUT PATCH.

From its union with the southeastern extremity of Cat Point Bar this patch has a due east course for 1 mile, with an average breadth of about 330 yards and an area of 123 acres. In outline it bears a crude resemblance to a peanut. The depth of water is from  $4\frac{1}{2}$  to 7 feet

and averages about 6 feet. The connecting grounds on the north side are about 1 foot below the bed, but on the south side, being near the channel, they are 3 or 4 feet deeper. The bottom consists mostly of mud. The patch is composed entirely of dense growth, as shown in the following tables:

OYSTER GROWTH ON PEANUT PATCH.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 123	Bushels. 140	Bushels. 547	Bushels. 687	Bushels. 84,501

DETAILS OF EXAMINATION OF PEANUT PATCH.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
241....	Feb. 3	6.0	2.21	0	13.6	14.9	4	121	396	517	Dense.
242....	do....	6.0	2.21	0	18.5	15.8	5	165	420	585	Do.
250....	do....	6.0	2.21	0	22.6	19.0	7	169	506	675	Do.
251....	do....	5.5	2.38	.8	10.5	10.5	4	93	279	372	Do.
260....	do....	7.0	2.04	0	8.8	12.3	2	78	327	405	Do.
261....	do....	6.0	2.21	1.4	9.9	26.2	1	88	696	784	Do.
268....	do....	6.0	2.21	0	13.1	10.4	9	116	277	393	Do.
269....	do....	6.0	2.21	2.3	18.5	22.2	5	165	591	756	Do.
270....	do....	6.0	2.21	.9	30.3	22.2	8	260	591	851	Do.
271....	do....	6.5	2.12	.9	30.6	19.8	10	262	526	788	Do.
457....	Feb. 15	7.0	2.04	0	16.2	34.3	10	138	792	930	Do.
458....	do....	7.5	2.04	1.5	16.2	52.4	2	144	1,394	1,538	Do.
459....	do....	8.0	2.04	0	6.9	20.1	6	61	535	596	Do.
494....	Feb. 17	7.0	2.04	0	2.0	6.4	0	18	170	188	Do.
495....	do....	7.0	2.04	0	25.0	26.7	0	222	710	932	Do.

The oysters were found mostly in clusters, although some singles were noted. A number of the stations, especially on the eastern half of the bed, showed rather a large percentage of the raccoon or scissor-bill type. On the days of the examination the oysters varied in quality from poor to good, the better grades being on the central and west portions of the bed. They are used largely for steam stock. Barnacles, mussels, coral, and *Martesia* were observed at nearly all of the stations, but in small quantities.

## 11. CAT POINT BAR.

It may be said that this large, productive bar has its origin in a broad skirting of dense growth along the north shore at Cat Point and spreads southward to the dredged channel or cut-in line of beacons B. C. F. and B. C. R. The channel is recognized as an arbitrary line of demarcation. The bed, however, extends entirely across the sound to St. George Island, a distance of about 4 miles.

The eastern boundary is practically a straight line running in a south-southeast direction to Peanut Patch. The western boundary is indented and very irregular and has two rather prominent projections and two corresponding inlets or bays. It has a length of about 2 miles, an average width of five-eighths mile, and an area of 794 acres. The depth of water ranges from 3 to 7 feet, the greater depth being along the east and west terminations. Through the center of the bed there is a rather broad north and south ridge, which slopes both to the east and west. The marginal elevations are from 1 to 2 feet above the adjacent regions. The bottom is firm and in good condition, excepting that the east and west borders are inclined to be soft or muddy.

The present limits of the bed have not changed greatly since the survey made 20 years ago. It appears, however, that there has been a gradual shifting to the westward and that the western border has become more irregular and indented. The width has remained nearly constant.

The greater part of the bar is covered by dense growth, within which are four patches of scattering growth and one small area of depleted bottom. The oysters are found mostly in rather small clusters and singles. Not many of the raccoon or scissor-bill type were observed. They vary in flavor from fair to good and fatten readily when the comparatively fresh and food-laden water from East Bay flows over the bed.

The bar is extensively fished and has been a good producer. During the survey as many as 38 oyster schooners were engaged in the industry at one time. There were shipped daily to Carrabelle, Fla., from this and some of the bars to the eastward from 75 to 150 gallons of oysters. Out of 100 gallons of freshly shucked stock there was only about 1 quart of dark or discarded oysters of poor quality. No pink or yellow color was observed or reported from this bed. The oysters will yield about  $1\frac{1}{2}$  gallons per tub of 2.2 standard bushels.

There were many mussels and barnacles and some *Martesia* in the old shells. Algæ were found on the clusters near shore.

The following tables show the area and distribution of oyster growth:

OYSTER GROWTH ON CAT POINT BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	686	78	473	551	377,986
Scattering.....	102	40	114	154	15,708
Depleted.....	6	63	21	84	504
Total.....	794				394,198



## DETAILS OF EXAMINATION OF CAT POINT BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
276....	Feb. 3	3.5	3.35	2.7	8.9	7.1	3	79	189	268	Dense.
277....	do.	3.5	3.35	2.8	9.2	8.1	3	82	216	298	Do.
278....	do.	3.5	3.35	2.4	16.1	12.5	5	143	332	475	Do.
279....	do.	7.0	2.04	0	7.3	10.3	5	65	274	339	Do.
281....	do.	6.5	2.12	0	11.3	17.5	9	101	465	566	Do.
282....	do.	7.0	2.04	.9	13.7	20.6	3	122	547	669	Do.
283....	do.	6.0	2.21	.9	19.9	33.9	12	177	902	1,079	Do.
297....	do.	7.0	2.04	0	2.5	26.5	5	22	705	727	Do.
298....	do.	4.5	2.80	1.8	11.8	15.7	4	105	417	522	Do.
300....	do.	5.5	2.38	.4	5.5	22.3	7	45	593	638	Do.
301....	Feb. 4	4.5	2.80	1.1	17.5	21.1	9	156	561	717	Do.
324....	Feb. 9	7.0	2.04	1.5	2.0	17.2	14	18	457	475	Do.
363....	Feb. 10	4.0	3.05	0	4.3	11.1	2	38	295	333	Do.
365....	do.	5.0	2.55	0	20.4	21.6	15	182	574	756	Do.
410....	Feb. 12	4.5	2.80	0	17.2	38.2	6	153	1,002	1,155	Do.
411....	do.	6.0	2.21	0	11.3	19.9	5	101	529	630	Do.
412....	do.	5.0	2.55	0	2.7	9.4	6	24	250	274	Do.
413....	do.	5.0	2.50	0	6.3	13.3	6	56	354	410	Do.
417....	Feb. 15	8.0	2.04	0	2.5	11.3	7	22	300	322	Do.
418....	do.	4.5	2.80	0	6.8	7.5	11	60	200	260	Do.
419....	do.	4.0	3.05	.3	9.8	23.6	4	87	628	715	Do.
421....	do.	8.0	2.04	0	4.4	23.5	8	39	625	664	Do.
422....	do.	8.0	2.04	0	6.9	24.5	1	61	652	713	Do.
423....	do.	7.0	2.04	0	6.9	31.4	5	61	835	896	Do.
424....	do.	5.0	2.55	0	5.9	16.5	2	52	439	491	Do.
425....	do.	5.0	2.55	0	11.4	33.7	5	102	897	999	Do.
426....	do.	5.0	2.55	0	13.3	18.1	8	118	482	600	Do.
427....	do.	5.0	2.55	0	16.5	16.5	7	147	439	586	Do.
429....	do.	8.5	2.04	0	10.3	13.7	4	92	364	456	Do.
431....	do.	5.0	2.55	0	7.1	16.1	3	63	428	491	Do.
433....	do.	6.0	2.21	0	3.6	15.4	3	32	409	441	Do.
434....	do.	8.0	2.04	0	11.8	15.2	2	105	404	509	Do.
435....	do.	7.0	2.04	2.0	14.2	22.6	1	126	601	727	Do.
436....	do.	5.0	2.55	0	5.5	23.6	4	49	628	677	Do.
437....	do.	4.0	3.05	0	18.7	30.2	9	165	804	969	Do.
438....	do.	4.0	3.05	0	11.8	24.9	4	105	662	767	Do.
449....	do.	5.5	2.38	0	8.8	20.6	3	78	548	626	Do.
450....	do.	7.0	2.04	0	16.7	44.6	4	149	1,186	1,335	Do.
467....	Feb. 16	9.0	2.04	0	7.2	19.1	2	64	192	256	Do.
468....	do.	5.5	2.38	.4	6.7	10.1	0	60	268	328	Do.
470....	do.	5.0	2.55	.8	15.7	16.1	2	140	428	568	Do.
471....	do.	5.0	2.55	.8	12.9	12.5	4	115	332	447	Do.
472....	do.	7.0	2.04	2.4	6.4	15.7	0	57	417	474	Do.
473....	do.	8.0	2.04	.5	3.4	9.3	0	30	238	268	Do.
475....	do.	8.0	2.04	1.0	5.4	15.7	1	48	417	465	Do.
476....	do.	8.0	2.04	0	6.9	13.7	1	61	364	425	Do.
477....	do.	5.0	2.55	0	6.3	14.5	1	56	386	442	Do.
478....	do.	5.0	2.55	0	1.2	10.9	2	11	290	301	Do.
479....	do.	5.0	2.55	2.7	3.9	5.9	0	35	157	192	Do.
480....	do.	6.0	2.21	0	6.8	21.7	2	61	576	637	Do.
481....	do.	8.5	2.04	0	6.4	12.8	1	57	340	397	Do.
482....	do.	8.0	2.04	0	4.9	11.3	3	43	301	344	Do.
485....	do.	7.5	2.04	1.0	2.5	16.2	3	22	431	453	Do.
488....	do.	8.0	2.04	2.0	3.9	14.7	0	35	391	426	Do.
491....	do.	8.0	2.04	0	1.0	10.8	0	9	287	296	Do.
493....	do.	4.5	2.38	1.8	8.9	18.6	3	79	495	574	Do.
275....	Feb. 3	3.0	3.65	.8	3.1	4.1	1	28	109	137	Scattering.
280....	do.	6.0	2.21	0	3.2	4.5	2	28	119	147	Do.
296....	Feb. 4	6.5	2.12	0	5.5	4.2	1	4	112	116	Do.
299....	do.	5.0	2.55	0	1.2	3.9	8	11	104	115	Do.
364....	Feb. 10	7.0	2.04	0	4.4	3.9	10	39	104	143	Do.
414....	Feb. 12	5.0	2.55	.4	3.5	5.1	4	31	136	167	Do.
415....	do.	6.0	2.21	0	2.7	5.4	3	24	144	168	Do.
420....	Feb. 15	4.5	2.80	0	2.8	4.6	4	25	122	147	Do.
428....	do.	8.0	2.04	0	2.9	2.9	2	26	77	103	Do.
430....	do.	6.0	2.21	0	6.3	5.4	6	56	143	199	Do.
469....	Feb. 16	5.0	2.55	1.2	3.5	3.1	2	31	82	113	Do.
486....	do.	5.5	2.38	1.3	2.5	4.6	0	22	122	144	Do.
487....	do.	5.0	2.55	2.4	7.1	5.1	1	63	136	199	Do.
489....	do.	8.0	2.04	1.5	10.8	5.4	0	96	144	240	Do.
490....	do.	6.0	2.21	0	1.8	2.3	0	16	61	77	Do.
492....	do.	6.0	2.21	0	15.4	4.1	10	137	109	246	Do.
432....	Feb. 15	5.0	2.55	0	7.1	.8	5	63	21	84	Depleted.

## 12. BULKHEAD AND EAST HOLE BARS.

These two large, continuous reefs may, for the purposes of this discussion, be designated as one body. They lie in a broad, but gradually narrowing, band reaching in a southeast direction from the dredged channel or cut, immediately south of Cat Point Bar, to St. George Island. The bars have a length of nearly 3 miles, an average width of about three-fourths mile, and an approximate area of 1,379 acres. The northernmost portion is locally denominated Bulkhead Bar, the remaining part East Hole Bar. There appears to be no distinct line of separation between the beds, but there is a difference in the quality of the stock.

With the exception of a projection on the extreme west border and an indentation or bay at the southeast corner the outlines of the beds are fairly straight. The depth of water (mean low level) is from  $5\frac{1}{2}$  to 9 feet on the upper part and from  $1\frac{1}{2}$  to  $5\frac{1}{2}$  feet on the lower. The bottoms are composed of mud, or mud and sand, with some shell, and are raised above the adjacent territory from 1 to 5 feet. The beds appear to have progressed slightly westward during the last 20 years.

About 95 per cent of the total area of the beds has dense growth. The remaining portion, consisting of 57 acres situated off St. George Island, has scattering or very scattering growths and depleted bottoms. The oysters occur in clusters and as singles, generally of good shape, although at several stations the clustered raccoon type predominated, particularly on the denser and unworked areas. At the time of the examination the quality of the material varied from poor to good, the better grades being found along the upper and central parts of East Hole Bar. Mussels and barnacles were plentiful at several stations. Algæ were abundant especially near the south shore.

But very little oystering was being pursued on Bulkhead Bar during the survey. It was stated that the product from this bed is used more particularly for steam stock. It appears that this bar would be improved by more extensive fishing. From six to eight boats were engaged in the fishery on east Hole Bar and were obtaining a good yield and satisfactory prices.

More than 90 biological stations were made on these bars. The areas, details of examination, and other data are given in the following tables:

## OYSTER GROWTH ON BULKHEAD AND EAST HOLE BARS.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	1,322	120	789	909	1,201,698
Scattering.....	12	58	112	170	2,040
Very scattering.....	30	39	53	92	2,760
Depleted.....	15	13	13	26	390
Total.....	1,379				1,206,888

## DETAILS OF EXAMINATION OF BULKHEAD AND EAST HOLE BARS.

Sta- tion.	Date of exami- nation.	Depth of water.	Area cov- ered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Mar- ket.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
302....	Feb. 4	6.5	2.12	0	14.6	22.2	9	130	580	710	Dense.
303....	do.	10.0	2.04	2.9	8.8	18.6	9	78	495	573	Do.
304....	do.	7.5	2.04	2.4	15.2	43.2	3	135	1,148	1,283	Do.
305....	do.	11.0									Do.
306....	do.	8.0	2.04	2.0	11.8	15.2	2	105	404	509	Do.
307....	do.	8.5	2.04	0	10.8	14.7	7	96	391	487	Do.
309....	do.	9.5	2.04	.5	9.8	22.1	5	87	587	674	Do.
310....	do.	9.0	2.04	2.0	6.9	22.1	4	61	587	648	Do.
311....	do.	9.0	2.04	0	15.2	40.6	4	135	1,080	1,215	Do.
312....	do.	8.5	2.04	0	24.5	26.5	5	218	704	922	Do.
313....	do.	8.0	2.04	0	6.9	24.5	12	61	652	713	Do.
314....	do.	5.5	2.38	0	10.5	34.4	12	93	914	1,007	Do.
315....	do.	5.5	2.38	0	21.4	44.2	7	191	1,173	1,364	Do.
316....	do.	8.5	2.04	0	18.6	42.7	5	166	1,135	1,301	Do.
317....	do.	7.5	2.04	0	31.8	53.4	12	283	1,419	1,702	Do.
318....	Feb. 9	8.0	2.04	0	19.1	20.6	16	170	547	717	Do.
319....	do.	8.0	2.04	0	18.1	26.9	17	161	715	876	Do.
321....	do.	7.0	2.04	3.9	26.0	47.5	16	232	1,263	1,495	Do.
322....	do.	5.0	2.55	0	18.1	23.6	10	161	626	787	Do.
323....	do.	6.0	2.21	0	3.6	9.1	6	32	242	274	Do.
326....	do.	8.5	2.04	0	8.8	14.2	4	78	378	456	Do.
327....	do.	6.5	2.12	0	13.7	31.6	9	122	841	963	Do.
328....	do.	5.0	2.55	.4	19.2	25.9	12	171	687	858	Do.
329....	do.	10.5	2.04	.5	10.8	16.7	16	96	444	540	Do.
330....	do.	6.5	2.12	0	11.3	17.9	8	101	476	577	Do.
331....	do.	5.0	2.55	0	14.5	27.5	8	129	732	861	Do.
332....	do.	5.0	2.55	0	18.8	46.7	12	167	1,242	1,409	Do.
333....	do.	4.5	2.80	0	13.2	33.6	7	117	884	1,001	Do.
336....	do.	5.5	2.38	1.3	15.9	35.7	9	141	950	1,091	Do.
337....	do.	5.0	2.55	0	6.3	18.0	8	56	479	535	Do.
338....	do.	6.5	2.12	0	15.1	48.6	13	134	1,292	1,426	Do.
339....	do.	6.5	2.12	1.4	25.4	42.8	14	226	1,140	1,366	Do.
340....	do.	6.5	2.12	0	10.8	33.0	13	96	878	974	Do.
346....	do.	10.0	2.04	0	3.9	18.6	7	35	494	529	Do.
347....	do.	7.0	2.04	0	12.2	22.6	12	109	601	710	Do.
348....	do.	7.0	2.04	1.0	13.2	70.2	12	117	1,865	1,982	Do.
349....	do.	7.0	2.04	0	19.6	24.5	13	175	652	827	Do.
439....	Feb. 15	7.5	2.04	0	12.2	29.9	3	109	795	904	Do.
440....	do.	6.5	2.12	0	8.0	42.5	3	71	1,130	1,201	Do.
441....	do.	6.5	2.12	0	6.1	29.3	5	54	779	833	Do.
442....	do.	6.0	2.21	.9	6.8	19.9	6	61	529	590	Do.
443....	do.	7.0	2.04	1.5	14.7	20.6	5	131	547	678	Do.
444....	do.	6.0	2.21	0	7.7	10.0	5	669	266	335	Do.
445....	do.	6.5	2.12	0	14.2	21.7	8	126	577	706	Do.
446....	do.	6.5	2.12	1.9	28.8	52.4	11	256	1,391	1,647	Do.
447....	do.	7.5	2.04	.5	11.6	17.2	10	103	457	560	Do.
448....	do.	10.0	2.04	0	6.4	15.2	2	57	404	461	Do.
451....	do.	8.5	2.04	0	12.3	17.2	7	110	457	567	Do.
452....	do.	9.5	2.04	0	7.4	47.1	2	66	1,252	1,318	Do.
453....	do.	8.0	2.04	0	11.8	28.4	4	105	755	860	Do.
454....	do.	9.0	2.04	0	14.7	91.2	3	131	2,425	2,556	Do.
455....	do.	8.5	2.04	0	11.3	42.2	5	96	975	1,071	Do.
456....	do.	10.5	2.04	0	6.9	11.8	2	59	272	331	Do.

## DETAILS OF EXAMINATION OF BULKHEAD AND EAST HOLE BARS—Continued.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. gds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
460....	Feb. 15	10.0	2.04	0	15.7	28.9	• 3	140	796	936	Dense.
461....	do.....	9.0	2.04	0	9.3	26.0	3	83	691	774	Do.
462....	do.....	7.0	2.04	3.4	17.7	75.4	7	155	1,995	2,150	Do.
463....	do.....	7.5	2.04	0	9.3	36.8	3	83	979	1,062	Do.
464....	do.....	7.0	2.04	0	14.2	31.4	4	126	835	961	Do.
465....	do.....	8.0	2.04	0	16.2	62.2	5	144	1,655	1,799	Do.
466....	do.....	10.0	2.04	0	12.7	15.7	8	113	417	530	Do.
496....	Feb. 17	9.5	2.04	0	10.3	15.2	0	92	405	497	Do.
497....	do.....	8.0	2.04	0	18.6	29.4	0	165	782	947	Do.
498....	do.....	6.5	2.12	0	10.4	17.9	0	93	476	569	Do.
499....	do.....	6.0	2.21	1.8	14.5	27.6	0	129	735	864	Do.
500....	do.....	5.5	2.38	0	10.5	18.5	0	93	492	585	Do.
501....	do.....	6.0	2.21	0	12.7	36.2	0	113	964	1,077	Do.
502....	do.....	5.0	2.55	0	5.1	15.7	0	45	418	463	Do.
503....	do.....	5.0	2.55	0	11.4	28.2	0	102	751	853	Do.
504....	do.....	7.0	2.04	2.0	3.9	31.4	0	35	836	871	Do.
505....	do.....	9.0	2.04	0	12.7	32.8	1	113	874	987	Do.
506....	do.....	10.0	2.04	0	8.3	31.9	1	74	849	923	Do.
507....	do.....	6.0	2.21	0	5.4	39.8	1	48	1,059	1,107	Do.
508....	do.....	5.0	2.55	0	13.7	44.7	0	122	1,189	1,311	Do.
509....	do.....	5.5	2.38	0	6.3	33.6	1	56	894	950	Do.
510....	do.....	6.0	2.21	0	10.0	25.8	3	89	686	775	Do.
511....	do.....	6.5	2.12	0	9.0	35.8	0	80	953	1,033	Do.
512....	do.....	6.0	2.21	0	17.6	41.2	0	156	1,095	1,251	Do.
513....	do.....	5.0	2.55	0	8.6	26.3	1	76	700	776	Do.
514....	do.....	10.0	2.04	2.5	12.3	18.2	1	109	484	593	Do.
515....	do.....	9.0	2.04	0	21.1	53.5	1	188	1,442	1,630	Do.
516....	do.....	6.0	2.21	0	14.9	17.6	3	132	468	600	Do.
517....	do.....	5.5	2.38	0	8.4	20.6	1	75	548	623	Do.
519....	do.....	4.0	3.05	0	10.5	9.5	2	93	252	345	Do.
520....	do.....	8.0	2.04	0	12.3	24.1	3	109	641	750	Do.
521....	do.....	10.0	2.04	.5	5.9	14.2	4	53	378	431	Do.
523....	do.....	4.0	3.05	.6	8.8	15.9	4	78	423	501	Do.
525....	do.....	6.0	2.21	0	21.3	34.9	1	189	930	1,119	Do.
526....	do.....	6.5	2.12	0	17.4	25.4	4	155	675	830	Do.
522....	do.....	3.5	3.35	0	6.6	4.2	5	58	112	170	Scattering.
286....	Feb. 3	2.0	4.50	1.8	4.4	2.0	2	39	53	92	Very scattering.
518....	Feb. 17	7.0	2.04	0	1.5	.5	0	13	13	26	Depleted.

## 13. PATCHES EAST OF BULKHEAD AND EAST HOLE BARS.

There is a small patch of 3 acres just offshore of St. George Island and about three-fourths mile east of Bulkhead Point. It has a depth of water of  $3\frac{1}{2}$  feet and a sandy bottom with but little or no elevation. The patch has dense growth of clustered oysters, on which were many mussels and both red and green algæ. The oysters were fresh and not in good condition at the time of the investigation.

Another patch of 2 acres is situated about five-eighths mile due north of Bulkhead Point. The bottom is composed of mud, sand, and shells and is practically on a level with the adjacent grounds. The depth of water is 9 feet. The oysters are found in clusters and consist mostly of the raccoon or scissor-bill type. About 12 per cent were dead. Mussels and barnacles were noted.

The following tables show the data obtained from these patches:

OYSTER GROWTH ON PATCHES EAST OF BULKHEAD AND EAST HOLE.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 5	Bushels. 109	Bushels. 288	Bushels. 397	Bushels. 1,985

DETAILS OF EXAMINATION OF PATCHES EAST OF BULKHEAD AND EAST HOLE BARS.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
265....	1915. Feb. 3	<i>Fect.</i> 3.5	<i>Sq. yds.</i> 3.35	0	13.7	9.5	1	<i>Bush.</i> 122	<i>Bush.</i> 263	<i>Bush.</i> 385	Dense. Do.
287....	do.....	10.5	2.04	4.4	10.8	11.7	5	96	312	408	

14. PELICAN BAR (APALACHICOLA BAY).

This bar or reef is situated in Apalachicola Bay about 1 mile west of East Hole and immediately north of Signal Wharf. From shore it extends northeastward for about one-half mile, thence turns west by north and follows this direction for 1 mile. It has an average width of a little over 500 yards and an area of 298 acres. The dense area, with the exception of a small patch on the western margin, occupies the central portion of the bed and is practically surrounded by very scattering growth or depleted bottoms. The depth of water is from one-half foot to 5½ feet on the bar, the limits of which are but slightly elevated above the adjoining grounds. The bottom is hard sand with some mud and shells.

During the last 20 years the bed has grown in all directions to about six times its former size. The increase is especially noticeable on the south and west.

The oysters were found in clusters of rather good shape and size, although some stations revealed a number of scissor-bills. The quality ranged from poor to good. The better grades, as a rule, were taken on the dense growth. At the time of the examination only one or two boats were tonging on the bar. Mussels, barnacles, and algæ were observed at several points.

The following tables exhibit the results of the examination of this bed:

## OYSTER GROWTH ON PELICAN BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 91	Bushels. 116	Bushels. 583	Bushels. 699	Bushels. 63,609
Very scattering.....	110	58	52	110	12,100
Depleted.....	97	10	3	13	1,261
Total.....	298				76,970

## DETAILS OF EXAMINATION OF PELICAN BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
534....	Feb. 18	5.0	2.55	0.4	18.0	20.4	3	160	543	703	Dense.
535....	do.....	7.0	2.04	0	13.2	12.7	2	117	338	455	Do.
557....	Feb. 22	7.0	2.04	0	13.2	39.2	15	117	1,042	1,159	Do.
558....	do.....	7.0	2.04	0	14.2	31.4	17	126	835	961	Do.
559....	do.....	7.5	2.04	0	6.4	15.7	7	57	417	474	Do.
562....	do.....	6.0	2.21	.5	9.0	28.5	5	80	758	838	Do.
563....	do.....	5.0	2.55	2.0	16.5	21.6	14	147	575	722	Do.
566....	do.....	8.0	2.04	0	16.7	46.6	2	149	1,239	1,388	Do.
567....	do.....	6.5	2.12	0	17.5	22.2	3	156	591	747	Do.
568....	do.....	7.5	2.04	2.5	24.0	19.1	0	214	508	722	Do.
570....	do.....	8.0	2.04	0	17.2	30.4	0	153	809	962	Do.
571....	do.....	7.0	2.04	1.5	3.4	9.8	3	30	239	269	Do.
574....	do.....	7.0	2.04	1.0	8.3	18.1	2	74	481	555	Do.
575....	do.....	4.5	2.80	2.9	8.9	8.6	1	79	229	308	Do.
576....	Feb. 24	5.0	2.55	0	9.8	14.5	3	87	386	473	Do.
585....	Feb. 25	5.0	2.55	.4	12.2	12.5	1	109	332	441	Do.
560....	Feb. 22	4.0	3.05	.7	8.5	3.3	6	76	88	164	Very scattering.
561....	do.....	4.0	3.05	0	5.2	1.6	1	46	42	88	Do.
564....	do.....	4.5	0	5.4	1.4	.2	2	48	37	85	Do.
577....	Feb. 24	7.0	2.04	0	6.9	1.5	2	61	40	101	Do.
556....	Feb. 22	8.0	2.04	.5	.5	0	5	.4	0	4	Depleted.
565....	do.....	6.0	2.21	0	3.6	0	1	32	0	32	Do.
569....	do.....	9.0	2.04	0	.5	.5	1	4	13	17	Do.
573....	do.....	6.5	a 2.12								Do.

a 36 oysters, all dead.

## 15. PATCHES BETWEEN EAST HOLE AND PELICAN BARS.

These three small patches, less than a half-mile off St. George Island, are situated between East Hole and Pelican Bars. The combined area is 43 acres, the greater part of which has dense growth of clustered oysters of fair quality. The largest patch, somewhat crescent-shaped, measures about three-eighths mile in length by one-eighth mile in width and contains about 30 acres. The other patches are nearly circular in outline. The bottom is hard sand with mud and shells. No oystering was being conducted on these lumps at the time of the survey.

The general extent and condition of the patches are shown in the following tables:

OYSTER GROWTH ON PATCHES BETWEEN EAST HOLE AND PELICAN BARS.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 38	Bushels. 75	Bushels. 448	Bushels. 523	Bushels. 19,874
Scattering.....	5	60	100	160	800
Total.....	43				20,674

DETAILS OF EXAMINATION OF PATCHES BETWEEN EAST HOLE AND PELICAN BARS.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
352....	1915. Feb. 9	<i>Fect.</i> 9.0	<i>Sq. yds.</i> 2.04	0	7.3	8.8	2	<i>Bush.</i> 65	<i>Bush.</i> 234	<i>Bush.</i> 299	Dense.
579....	Feb. 24	8.5	2.04	0	11.3	14.7	5	100	391	491	Do.
580....	do.....	6.0	2.21	0.5	7.7	19.5	4	69	518	587	Do.
581....	do.....	5.0	2.55	0	12.9	35.3	2	115	938	1,053	Do.
582....	do.....	6.0	2.21	0	2.7	5.9	4	24	157	181	Do.
533....	Feb. 18	4.0	3.05	1.6	10.5	2.9	2	93	77	170	Scattering.
578....	Feb. 24	4.5	2.80	0	2.9	4.6	2	26	122	148	Do.

## 16. EAST LUMPS.

These three unimportant lumps off East Bay, situated midway between Cat Point and Bulkhead Bars on the east and Norman Bar on the west, have a combined area of 224 acres. The largest and northernmost lump has a length in a north and south direction of about seven-eighths mile, a width of one-fourth mile, and an area of 144 acres, the greater part of which is covered with dense growth. It has a depth of water of  $5\frac{1}{2}$  to 6 feet and but very little or no elevation above the surrounding bottoms. On the edges of the bar there is black mud and more or less covered oysters.

The second lump has an area of 25 acres, a depth of water of 6 to 7 feet, and an elevation of about 1 foot along the northern limits. The extreme western portion has dense growth; otherwise it is very scattering.

The third or southernmost lump has an area of about 55 acres, a depth of water of 8 or 9 feet, and supports dense and very scattering growths and depleted bottoms.

Comparing the present chart with the one made 20 years ago by this Bureau, it is observed that the first two or northernmost lumps

are but the remains of a long, narrow reef which had at that time scattering growths of oysters. It measured then about 3 miles in length by one-fourth mile in width. The third lump is comparatively new, having been built up on a hard sand bottom within recent years.

The oysters of these lumps are largely clusters of the raccoon or scissor-bill type and are covered with hundreds of small mussels and small barnacles. Some of the oysters are of good shape, but they are inclined to be flattish and generally of poor quality and flavor. The central part of the largest lump has a good, firm foundation, which would produce a fair marketable product if the clusters were broken up and culled; otherwise it does not appear to yield oysters of merchantable quality. This part of the bay is evidently filling in with mud and silt and is, therefore, hardly worth the labor necessary to obtain good oysters.

One Florida tub of mostly clustered and uncultured oysters from these lumps gave the following results: Small oysters, 67; counts, 152; large, 180; dead, 13; shells, 30; total, 442.

The following tables furnish further data of a general character:

OYSTER GROWTH ON EAST LUMPS.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	168	102	453	555	93,240
Scattering.....	4	18	77	95	380
Very scattering.....	24	44	54	98	2,352
Depleted.....	28				
Total.....	224				95,972

DETAILS OF EXAMINATION OF EAST LUMPS.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
544....	Feb. 18	7.0	2.04	0	11.8	13.2	2	105	351	456	Dense.
547....	Feb. 22	8.0	2.04	0	8.8	19.6	6	78	521	599	Do.
548....	do.	8.0	2.04	0	8.8	18.1	4	78	481	559	Do.
549....	do.	8.0	2.04	0	2.9	9.8	4	26	261	287	Do.
550....	do.	8.0	2.04	0	4.4	23.5	6	39	625	664	Do.
737....	Mar. 9	7.0	2.04	0	16.7	25.0	7	148	665	813	Do.
738....	do.	7.0	2.04	0	16.2	17.6	3	144	468	612	Do.
739....	do.	7.0	2.04	0	15.7	11.8	2	139	314	453	Do.
740....	do.	7.0	2.04	0	7.3	10.3	3	65	274	339	Do.
741....	do.	7.5	2.04	0	5.4	12.2	3	48	324	372	Do.
742....	do.	8.0	2.04	0	9.8	13.2	2	87	351	438	Do.
743....	do.	7.5	2.04	0	9.8	5.9	1	87	157	244	Do.
744....	do.	7.0	2.04	0	12.2	24.0	0	108	639	747	Do.
745....	do.	7.0	2.04	0	6.9	7.8	0	61	207	268	Do.



## DETAILS OF EXAMINATION OF EAST LUMPS—Continued.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. gds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
746.....	Mar. 9	7.0	2.04	0	11.8	18.2	1	105	485	590	Dense.
747.....	do.....	7.5	2.04	0	6.4	26.4	6	57	703	760	Do.
748.....	do.....	7.0	2.04	0	13.2	17.2	1	117	457	574	Do.
749.....	do.....	7.0	2.04	0	19.1	26.0	4	170	692	862	Do.
750.....	do.....	7.0	2.04	0	20.1	19.6	2	178	521	699	Do.
751.....	do.....	7.0	2.04	0	26.4	12.2	0	235	301	536	Do.
752.....	do.....	7.0	2.04	0	23.6	18.6	1	210	460	670	Do.
553.....	Feb. 22	11.0	2.04	0	4.4	10.8	4	39	287	326	Do.
753.....	Mar. 9	8.0	2.04	0	7.8	18.1	1	69	446	515	Do.
754.....	do.....	8.5	2.04	0.5	8.8	16.2	1	78	400	478	Do.
756.....	do.....	10.0	2.04	0	7.4	20.6	3	66	509	575	Do.
757.....	do.....	10.5	2.04	0	10.3	23.6	2	91	582	673	Do.
760.....	do.....	10.0	2.04	0	15.2	30.4	5	135	750	885	Do.
361.....	Feb. 10	6.0	2.21	0	2.0	2.9	2	18	77	95	Scattering.
755.....	Mar. 9	8.5	2.04	0	2.9	2.4	0	26	59	85	Very scattering.
759.....	do.....	10.0	2.04	0	6.9	2.0	5	61	49	110	Do.
758.....	do.....	10.5	(a)								Depleted.

a Medium bottom.

## 17. NORMAN BAR.

This bar, which lies off East Bay, is composed of four small, productive patches having an aggregate area of about 45 acres. It is situated approximately 1 mile west of East Lumps and 2 miles east of the jetty. The three upper patches are raised about 1 foot above the neighboring floor and lie in  $5\frac{1}{2}$  to 6 feet of water. The lower or southernmost patch has about the same elevation, but is in slightly deeper water, being located near the channel. The bottom is sand and mud.

The three upper parts of the bar were formerly united into one long narrow bed, which extended farther northward and eastward than the present patches, but not so far to the south. The lower patch appears to have changed its shape somewhat and to have progressed both to the south and west.

The bed has dense growth throughout. The oysters are generally of good shape and occur in clusters with sharp edges. Not many mussels and barnacles were observed. On the southwest border of the upper patch the bottom was largely mud and black shells on which were growing raccoon oysters. At the time of the investigation the oysters were rather fresh, but fat and in good condition. This bar has not been worked much for the last two years, except during the rush season, when a few boats make quick trips with their catch to the market.

The growth and details of examination are given in the following tables:

## OYSTER GROWTH ON NORMAN BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 45	Bushels. 61	Bushels. 516	Bushels. 577	Bushels. 25,965

## DETAILS OF EXAMINATION OF NORMAN BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
653....	Mar. 1	8.0	2.04	0	4.4	13.7	0	39	338	377	Dense.
654....	do.....	8.0	2.04	1.5	3.4	24.5	0	30	606	636	Do.
655....	do.....	7.5	2.04	2.9	7.8	32.4	7	70	800	870	Do.
657....	do.....	7.5	2.04	1.0	9.3	41.2	6	83	1,018	1,101	Do.
659....	do.....	8.5	2.04	0	3.9	12.2	12	35	302	337	Do.
660....	do.....	7.0	2.04	2.9	6.9	11.3	1	61	279	340	Do.
661....	do.....	6.5	2.12	0	8.0	26.9	6	71	664	735	Do.
662....	do.....	8.0	2.04	2.9	10.3	27.9	6	92	690	782	Do.
663....	do.....	7.0	2.04	0	4.9	22.1	4	44	546	590	Do.
664....	do.....	8.0	2.04	0	2.5	13.7	3	22	338	360	Do.
665....	do.....	7.0	2.04	9.3	9.3	9.8	6	83	242	325	Do.
666....	do.....	7.0	2.04	0	11.8	14.7	6	105	363	468	Do.

## 18. THIGPEN BAR.

This bar, consisting of two small patches, is situated about  $1\frac{1}{2}$  miles south of Apalachicola and five-eighths mile west of the jetty. It has a depth of water of  $5\frac{1}{2}$  to 6 feet and practically no elevation above the adjacent soft bottoms. The bed is composed principally of mud and some black shells, with underlying hard sand. During the last 20 years it has decreased in extent from a long continuous bar of 13 acres to about 4 acres. This is, perhaps, due to a deposit of silt from the recent dredgings in the channel along the jetty.

The bar has dense growth. The oysters occur in clusters and singles and are generally of good shape and size. They were found to be fat and of good flavor. Many mussels and some barnacles were noted. Very little or no fishing was being conducted on this bar at the time of the investigation.

A small patch of about 2 acres in extent, apparently the remnant of a larger area, is situated a short distance south of the jetty. Depth of water is about 6 feet. The bottom is hard and consists of mud and buried shells.

The annexed tables show the area and distribution of oyster growth on Thigpen Bar.

## OYSTER GROWTH ON THIGPEN BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	<i>Acres.</i> 4	<i>Bushels.</i> 81	<i>Bushels.</i> 255	<i>Bushels.</i> 336	<i>Bushels.</i> 1,344

## DETAILS OF EXAMINATION OF THIGPEN BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
795....	1915. Mar. 15	<i>Feet.</i> 5.0	<i>Sq. yds.</i> 2.55	0	9.0	8.2	1	<i>Bush.</i> 80	<i>Bush.</i> 214	<i>Bush.</i> 294	Dense. Do.
868....	Mar. 19	6.0	2.21	0	8.1	11.8	1	82	297	379	

## 19. WEST LUMP AND ADJACENT PATCH.

This bar, lying a short distance northwest of the center of Apalachicola Bay, is situated about 2 miles southwest of the entrance to the dredged channel at the jetty. It is somewhat scythe-shaped in outline, measures about three-fourths mile in length, and 300 yards in width, and is 74 acres in extent. The depth of water is from 4½ to 6 feet. The bottom is composed of mud, sand, and shells and is raised 1 to 2 feet above the neighboring grounds. The bed supports a dense growth, excepting where scattering oysters were found on the projecting arm of the northwest border. During the interval since the last survey the bar appears to have shifted its position very slightly to the southwest and has maintained its average length and breadth fairly well. However, the eastern extremity has broadened somewhat, and the projecting arm is of recent growth.

The oysters were in rather small clusters or singles of general good shape, and at the time of the investigation (March 15) were fat, becoming milky, and varied in quality from poor to good. Mussels and barnacles in small numbers were observed at most of the stations. This bar is fished principally for raw stock.

The small patch, about one-half mile north of the lump, has a length of about three-eighths mile, a width of 140 yards, and contains approximately 17 acres, nearly three-quarters of which has dense growth, the remainder being very scattering. It is the remnant of a long, slender bar that had a length of about 1¼ miles. The bottom, composed of mud and sand, with some black shells, has an elevation of about 1 foot. The depth of water is 5½ to 7 feet. The oysters are in clusters of good shape, although some were flattish and of the

scissor-bill type. A number of the older shells were burrowed by the boring clam, *Martesia*. The oysters were fat and becoming milky. The best quality was found on the upper two-thirds of the patch. They are fished for raw stock.

The following tables give the data obtained from the lump and patch:

OYSTER GROWTH ON WEST LUMP AND ADJACENT PATCH.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	75	71	425	496	37,200
Scattering.....	11	29	126	155	1,705
Very scattering.....	5	0	62	62	310
Total.....	91				39,215

DETAILS OF EXAMINATION OF WEST LUMP AND ADJACENT PATCH.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
809....	Mar. 15	6.5	2.12	1.9	11.3	17.5	8	96	731	827	Dense.
813....	do.	7.0	2.04	0	8.3	16.6	4	70	354	424	Do.
814....	do.	7.0	2.04	0	11.3	17.1	3	96	364	460	Do.
815....	do.	9.0	2.04	2.7	8.3	25.0	3	70	532	602	Do.
817....	do.	8.0	2.04	0	12.7	18.1	5	108	386	494	Do.
819....	do.	8.0	2.04	0	7.4	39.2	6	63	835	898	Do.
823....	do.	7.0	2.04	0	4.4	24.0	20	37	511	548	Do.
826....	do.	7.0	2.04	0	9.9	8.8	10	84	166	250	Do.
828....	do.	6.0	2.21	0	9.0	10.8	6	77	230	307	Do.
829....	do.	7.0	2.04	0	5.4	22.1	5	46	470	516	Do.
830....	do.	8.0	2.04	0	4.4	11.3	1	37	240	277	Do.
831....	do.	8.0	2.04	1.0	7.4	13.7	3	63	282	345	Do.
822....	do.	9.0	2.04	0	3.4	5.9	1	29	126	155	Scattering.
816....	do.	8.5	2.04	0	0	2.9	0	0	62	62	Very scattering.

## 20. PATCH OFF NEW INLET.

This small circular patch of 5 acres is situated about 3 miles due south of West Lump and one-half mile off St. George Island at Signal Scaffold. It has a depth of water of about  $3\frac{1}{2}$  feet and lies on a hard sand shelf, to the north of which is a soft mud bottom in 8 to 12 feet of water. This district was a few years ago in or near the channel of an inlet or pass called New Inlet, connecting Apalachicola Bay with the Gulf of Mexico. The inlet is now completely filled with sand.

The oysters were dense, of clear shell, and in good-shaped clusters. They were fat, salty, and milky (March 18). Green and brown algæ, a few sea shells, sand collars, sandworms, etc., were observed. Very little or no fishing was being carried on at this place. A station

on the patch showed 35 bushels of seed and 196 bushels of marketable oysters per acre, making, all told, for the patch 175 bushels of seed and 980 bushels of marketable oysters.

## 21. HAGEN FLAT.

Hagen Flat, situated in the southwestern part of Apalachicola Bay, is about five-eighths mile east of St. Vincent Bar and nearly 3 miles north of St. George Island. It has a length, in an east and west direction, of about five-eighths mile, a maximum width of one-fourth mile, and an area of 62 acres. The depth of water ranges from  $5\frac{1}{2}$  to 6 feet along the southern termination to 7 feet at the northeastern limits. The bed is well elevated, being from 1 to 3 feet above the general level, and has a good solid foundation of sand and mud. We were able to penetrate the crust only about 5 or 6 inches with the testing pole.

During the last 20 years the bar appears to have changed its shape from a large Y and to have moved westward about one-fourth mile. It also has built up from a bed of dead shells to practically a dense growth throughout.

We found the oysters of this flat to be strong and vigorous, well-shaped, fat, of good flavor, but rather salty. They occur in both small and large clusters with sharp edges. One drill was taken, and but few dead oysters and mussels were noted. The bar is not fished extensively.

The following tables exhibit the growth of the oysters and details of examination:

OYSTER GROWTH ON HAGEN FLAT.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	54	99	634	733	39,582
Scattering.....	8	25	94	119	952
Total.....	62				40,534

DETAILS OF EXAMINATION OF HAGEN FLAT.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	Feet.	Sq. yds.					Bush.	Bush.	Bush.	
895.....	Mar. 19	9.0	2.04	0	9.9	23.1	3	84	492	576	Dense.
902.....	do.	8.0	2.04	0	4.9	28.4	3	42	605	647	Do.
904.....	do.	8.0	2.04	0.5	19.6	27.4	4	167	583	750	Do.
1040.....	Mar. 26	8.5	2.04	0	12.2	58.9	6	173	1,425	1,598	Do.
1041.....	do.	7.0	2.04	0	2.0	6.9	3	28	167	195	Do.
1042.....	do.	8.5	2.04	0	6.9	22.1	1	98	535	633	Do.
894.....	Mar. 19	10.0	2.04	0	2.9	4.4	3	25	94	119	Scattering.

## 22. GREEN POINT FLAT.

This roughly crescent-shaped flat of 170 acres, is located in the northwestern part of Apalachicola Bay, about  $1\frac{1}{2}$  miles south of Green Point and 2 miles east by north of St. Vincent Point. The approximate dimensions are 1 mile long by one-fourth mile wide. It has a depth of 5 to 6 feet at mean low tide. With the exception of a limited portion of the southeast border, which has an elevation of about 1 foot, the flat is practically on a level with the connecting barren grounds. The bottom is mud and sand on a hard sand foundation.

The bed has grown up within recent years on a hard to stiff bottom of the area stretching from Green Point to the head of St. Vincent Bar, and it appears that it would be greatly improved and produce a better grade of stock if it were planted extensively with shells in order to raise it above the general level of the contiguous bottoms.

The entire flat has dense growth. The oysters were found in large sharp-edged clusters, usually of a poor or scissor-bill type, with many attached mussels and some barnacles. The quality was generally poor and watery, although some oysters were fat and in good condition. From 2 to 10 dead or smothered oysters were noted at nearly every station, and at some places the cultch was black shells. This bar is oystered but very little.

The following tables present the conditions of this bar:

OYSTER GROWTH ON GREEN POINT FLAT.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	170	105	414	519	88,230

DETAILS OF EXAMINATION OF GREEN POINT FLAT.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	Feet.	Sq. yds.					Bush.	Bush.	Bush.	
785....	Mar. 10	7.5	2.04	0	2.4	14.7	4	28	391	419	Dense.
786....	do.....	7.0	2.04	0	6.4	9.9	2	75	264	339	Do.
787....	do.....	7.5	2.04	0	4.4	13.2	1	52	351	403	Do.
788....	do.....	8.0	2.04	0	12.2	17.6	2	144	468	612	Do.
909....	Mar. 19	7.0	2.04	0	8.8	21.1	5	104	561	665	Do.
910....	do.....	7.0	2.04	0	11.3	13.7	2	132	364	496	Do.
911....	do.....	8.0	2.04	0	9.3	17.6	3	110	468	578	Do.
944....	Mar. 24	6.0	2.21	0	10.4	17.7	5	123	471	594	Do.
945....	do.....	6.0	2.21	0	3.2	4.5	4	38	120	158	Do.
949....	do.....	6.0	2.21	0	9.5	18.1	3	112	481	593	Do.
1080....	Apr. 5	7.0	2.04	0.5	5.9	5.4	7	70	143	213	Do.
1081....	do.....	7.0	2.04	0	5.4	7.4	10	64	197	261	Do.
1082....	do.....	6.5	2.12	0	7.1	25.4	9	83	675	758	Do.
1083....	do.....	7.0	2.04	0	12.2	14.2	17	144	378	522	Do.
1084....	do.....	7.5	2.04	0	23.1	19.1	9	273	507	780	Do.
1085....	do.....	6.5	2.12	0	10.8	29.7	25	127	790	917	Do.

## 23. LUMPS BETWEEN HAGEN AND GREEN POINT FLATS.

Six small lumps situated between Hagen and Green Point Flats, a distance of about  $2\frac{1}{2}$  miles, range in size from 1 to 8 acres, with an aggregate area of 25 acres. They have a depth of water from 6 to 7 feet and an elevation of about 1 foot. The bottom is sand and mud.

The northernmost lump is of recent origin and has dense growth. The character and quality of the oysters are about equal to those of Green Point Flat.

The oysters of the two lumps near Hagen Flat are of dense growth and are about on a par with the product of that flat. These lumps appear to be progressing slowly westward.

Of the three intervening lumps, two have dense and one very scattering growth. At the time of the investigation the oysters were fat, in good condition, of good shape, and in rather small clusters. Very few mussels were noted. These lumps are the remnants of an extended area of scattered oysters with some dense growth.

The area and details of examination of the six lumps are given in the following tables:

OYSTER GROWTH ON LUMPS BETWEEN HAGEN AND GREEN POINT FLATS.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	22	56	468	524	11,528
Very scattering.....	3	6	26	32	96
Total.....	25				11,624

DETAILS OF EXAMINATION OF LUMPS BETWEEN HAGEN AND GREEN POINT FLATS.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
887....	Mar. 19	9.0	2.04	0	0.5	7.8	1	6	208	214	Dense.
890....	do.....	7.5	2.04	0	1.0	23.6	5	9	502	511	Do.
891....	do.....	9.0	2.04	0	8.8	23.1	2	75	492	567	Do.
892....	do.....	8.5	2.04	0	19.1	20.1	0	162	428	590	Do.
906....	do.....	8.5	2.04	0	5.4	16.2	2	46	345	391	Do.
914....	do.....	9.0	2.04	0	4.9	19.6	2	42	417	459	Do.
915....	do.....	9.0	2.04	0	6.4	41.6	0	54	886	940	Do.
889....	do.....	8.0	2.04	0	.5	1.0	2	6	26	32	Very scattering.

## 24. ST. VINCENT BAR.

This interesting bar or reef is located in the southwestern part of Apalachicola Bay, about 3 miles from West Pass. It begins with a fringe of very scattering growth of oysters at St. Vincent Point near the northeast limits of St. Vincent Island, extends eastward for some-

thing more than a mile, then turns abruptly southward and continues in that direction for about 4 miles. It is within  $1\frac{1}{4}$  miles of St. George Island, in the vicinity of Cape St. George Lighthouse. The average width is slightly less than one-half mile. The area is approximately 1,414 acres, of which about 41 per cent is dense growth, 27 per cent very scattering, and about 15 per cent each of scattering growth and depleted bottoms. The depth of the main bar at mean low water is about 2 to 4 feet on the western border and 6 to 8 feet on the eastern border, while on the northwestern portion it is from 3 to 6 feet, with parts exposed and others awash at low tide. The adjacent bottoms on the western side are 3 to 4 feet deeper than the bar and 1 to 2 feet deeper on the eastern side. The west portion is, therefore, rather steep, while on the east a more gradual incline is found. The southern extremity, which is about a half mile from the ship channel, has an elevation from 5 to 9 feet. The northern limits have little or no elevation. The bed has a good foundation and is composed of sand and shells, with some mud along the eastern side. The west portion is very compact and solid.

This bar is fortunate in its elevation and situation with reference to West Pass and the currents, in that during the fluctuation of the tides it has a rapid change of water. On the other hand, however, its position is unfortunate during violent storms, for the long continuance of salt water or a deposit of sediment or sand may smother the oysters.

With the exception of its detachment from Silva Bar, the reef has maintained its general shape and position in the bay during the last 20 years. During this period, however, it has become wider by approximately 300 yards, the northeastern portion has extended eastward, and the other sections have broadened principally to the westward. The lower two-thirds of the bar has recovered, to a considerable extent, from a bed of dead oysters or depleted bottom to a fair or good producer.

It is interesting to note that this bar has been depleted a number of times by storms or overfishing and has always recovered satisfactorily.

Inasmuch as the bar was showing signs of depletion, it was closed to the public by order of the Florida Shell Fish Commissioner during the latter half of the 1914-15 oyster season. It was closed, also, for the season 1912-13.

The oysters were found in small clusters or singles of good shape. During the survey they were, for the most part, fat, salty, of good flavor, and from good to excellent quality. Very few detrimental factors, such as mussels, barnacles, coral, and algæ, were noted, although two dead drills, some black shells, and slimy mud were observed at some stations along the eastern limits of the bar.



Seventy-nine biological stations were made on this bar, the data of which follow:

## OYSTER GROWTH ON ST. VINCENT BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	585	68	378	446	260,910
Scattering.....	218	27	113	140	30,520
Very scattering.....	391	16	50	66	25,806
Depleted.....	220	29	17	46	10,120
Total.....	1,414				327,356

## DETAILS OF EXAMINATION OF ST. VINCENT BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
957....	Mar. 24	7.5	2.04	0	3.9	8.8	2	55	213	268	Dense.
958....	do.....	7.0	2.04	0	2.0	10.3	5	28	250	278	Do.
959....	do.....	7.0	2.04	0	3.9	11.8	1	55	286	341	Do.
960....	do.....	6.0	2.21	0	2.3	27.2	7	33	659	692	Do.
961....	do.....	6.0	2.21	0	0.9	10.4	4	13	252	265	Do.
962....	do.....	4.0	3.05	0	4.9	14.4	6	69	349	418	Do.
963....	do.....	4.5	2.80	0	2.5	7.9	5	36	191	227	Do.
964....	do.....	7.5	2.80	0.5	3.4	6.9	0	48	167	215	Do.
966....	Mar. 25	8.0	2.04	0	1.0	6.4	2	14	155	169	Do.
968....	do.....	5.0	2.55	0	6.9	14.2	7	98	344	442	Do.
969....	do.....	4.5	2.80	0	16.1	38.8	9	229	940	1,169	Do.
970....	do.....	5.5	2.38	0	6.3	27.3	0	89	670	759	Do.
985....	do.....	6.5	2.12	0	1.9	17.4	5	27	421	448	Do.
986....	do.....	6.5	2.12	0	4.2	11.3	3	60	273	333	Do.
987....	do.....	7.0	2.04	0	1.5	21.6	3	21	522	543	Do.
988....	do.....	7.0	2.04	0	1.5	18.6	2	21	449	470	Do.
989....	do.....	7.0	2.04	0	6.4	21.1	2	91	510	601	Do.
990....	do.....	7.0	2.04	0	4.9	10.8	2	70	261	331	Do.
991....	do.....	7.0	2.04	0	13.2	33.8	5	187	817	1,004	Do.
992....	do.....	6.0	2.21	.5	3.2	19.6	3	45	474	519	Do.
993....	do.....	5.0	2.55	0	.4	10.9	1	6	264	270	Do.
994....	do.....	5.0	2.55	1.0	1.2	11.4	8	17	276	293	Do.
1001....	do.....	4.0	3.05	0	6.9	17.1	10	98	414	512	Do.
1002....	do.....	4.5	2.80	0	2.5	9.3	5	35	225	260	Do.
1004....	do.....	5.0	2.55	.4	2.0	23.9	4	28	578	606	Do.
1009....	do.....	4.0	3.05	0	10.1	15.7	2	143	379	522	Do.
1015....	Mar. 26	7.0	2.04	0	17.1	22.6	15	242	546	788	Do.
1016....	do.....	5.0	2.55	0	9.4	32.2	10	137	778	915	Do.
1018....	do.....	3.0	3.65	0	5.5	8.2	14	78	198	276	Do.
1019....	do.....	7.0	2.04	0	7.4	7.4	5	105	179	284	Do.
1020....	do.....	4.0	3.05	.7	6.6	12.5	3	94	302	396	Do.
1022....	do.....	7.0	2.04	0	3.9	6.4	3	55	154	209	Do.
1024....	do.....	4.5	2.80	0	2.5	13.3	5	35	322	357	Do.
1027....	do.....	5.0	2.55	0	3.1	14.1	10	44	341	385	Do.
1031....	do.....	5.0	2.55	.8	2.4	18.0	8	34	436	470	Do.
1032....	do.....	4.0	3.05	0	2.6	6.6	7	37	160	197	Do.
1035....	do.....	5.0	2.55	0	2.7	12.9	6	38	311	349	Do.
1038....	do.....	5.0	2.55	0	5.5	16.1	6	78	389	467	Do.
1048....	do.....	7.0	2.04	0	1.5	6.9	0	21	167	188	Do.
1064....	Mar. 27	5.0	2.55	0	4.3	8.2	4	61	198	259	Do.
1110....	Apr. 6	6.0	2.21	0	5.2	25.0	8	74	605	679	Do.
1208....	Apr. 8	4.0	3.05	0	8.8	14.7	16	94	447	541	Do.
956....	Mar. 24	8.0	2.04	0	0	5.4	2	0	131	131	Scattering.
965....	Mar. 25	8.5	2.04	0	1.0	4.4	5	14	107	121	Do.
971....	do.....	8.0	2.04	0	1.0	5.4	3	14	131	145	Do.
975....	do.....	8.0	2.04	0	1.0	3.9	2	14	94	108	Do.
976....	do.....	8.0	2.04	0	1.5	4.4	3	21	107	128	Do.
1003....	do.....	4.5	2.80	0	2.2	3.6	2	31	87	118	Do.
1007....	do.....	6.0	2.21	.5	3.2	5.9	2	45	143	188	Do.

## DETAILS OF EXAMINATION OF ST. VINCENT BAR—Continued.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Mar-ket.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
1017...	Mar. 26	7.0	2.04	0	1.0	3.9	13	14	94	108	Scattering.
1021...	do.	7.5	2.04	0	4.4	3.4	6	62	82	144	Do.
1023...	do.	4.5	2.80	0	1.8	3.2	11	26	77	103	Do.
1028...	do.	6.5	2.12	0	1.8	5.7	2	26	138	164	Do.
1030...	do.	7.0	2.04	0	1.5	5.9	5	21	143	164	Do.
1037...	do.	7.0	2.04	0	.5	3.9	5	7	94	101	Do.
1043...	do.	4.5	2.80	0.7	1.8	5.5	6	26	133	159	Do.
1044...	do.	7.0	2.04	0	1.5	5.9	2	21	143	164	Do.
1211...	Apr. 8	7.5	2.04	0	8.3	3.4	0	89	103	192	Do.
967...	Mar. 25	8.0	2.04	0	0	2.0	5	0	48	48	Very scattering.
973...	do.	8.5	2.04	0	0	1.5	4	0	36	36	Do.
974...	do.	8.0	2.04	0	1.5	2.4	3	21	58	79	Do.
983...	do.	8.0	2.04	0	.5	2.0	3	7	48	55	Do.
984...	do.	7.5	2.04	0	.5	2.9	2	7	70	77	Do.
1000...	do.	4.0	3.05	0	1.0	1.3	3	14	31	45	Do.
1005...	do.	7.0	2.04	0	2.0	2.0	0	28	48	76	Do.
1006...	do.	7.0	2.04	1.0	4.4	2.9	2	62	70	132	Do.
1008...	do.	6.0	2.21	.5	2.3	2.3	1	33	56	89	Do.
1025...	Mar. 26	8.0	2.04	0	.5	2.0	2	7	48	55	Do.
1029...	do.	7.5	2.04	0	.5	2.9	1	7	70	77	Do.
1034...	do.	7.5	2.04	0	0	1.5	2	0	36	36	Do.
1039...	do.	8.0	2.04	0	1.0	2.0	1	14	48	62	Do.
1118...	Apr. 6	6.0	2.21	0	.9	2.3	1	12	56	68	Do.
1119...	do.	6.0	2.21	0	2.7	1.3	1	38	31	69	Do.
1209...	Apr. 8	7.0	2.04	0	.5	1.5	0	5	45	50	Do.
972...	Mar. 25	8.5	2.04	0	0	1.0	5	0	24	24	Depleted.
978...	do.	8.0	2.04	.5	1.5	1.0	0	21	24	45	Do.
1026...	Mar. 26	7.0	2.04	1.5	6.9	1.0	5	84	24	108	Do.
1109...	Apr. 6	7.5	2.04	0	2.0	0	5	28	0	28	Do.
1111...	do.	7.0	2.04	0	1.0	.5	1	14	12	26	Do.

## 25. MIDDLE BAR.

This roughly cordate-shaped bed is of recent growth and is situated on the boundary between Apalachicola Bay and St. Vincent Sound and midway between Green Point Flat and Silva Bar. It has a length of about 750 yards, an average width of 300 yards, and contains approximately 48 acres. The depth at mean low water on the bar and on the adjoining territory is from 4 to 5 feet. The bottom is hard sand with some mud.

The oysters were found dense throughout and in small to medium-sized clusters with sharp edges. They were of good shape and ranged in quality from watery to good. Some black shells, mussels, small barnacles, and a few dead oysters were noted. But very little tonging was being conducted on the bar during the survey.

The following tables show the general conditions of this bed:

## OYSTER GROWTH ON MIDDLE BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	<i>Acres.</i> 48	<i>Bushels.</i> 49	<i>Bushels.</i> 396	<i>Bushels.</i> 445	<i>Bushels.</i> 21,360

## DETAILS OF EXAMINATION OF MIDDLE BAR.

Sta- tion.	Date of exami- nation.	Depth of water.	Area cov- ered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Mar- ket.	Total.	
1097...	1915. Apr. 5	<i>Fect.</i> 6.0	<i>Sq. yds.</i> 2.21	0	3.6	11.8	3	<i>Bush.</i> 42	<i>Bush.</i> 314	<i>Bush.</i> 356	Dense.
1174...	Apr. 7	6.5	2.12	0	8.0	18.9	7	86	574	660	Do.
1177...	do.....	6.5	2.12	0	1.9	9.9	2	20	301	321	Do.

## 26. SILVA BAR.

Formerly Silva and St. Vincent Bars constituted one continuous oyster reef without a distinct line of demarcation, but within the last two decades a decided severance occurred, so that the two are now separated by a stretch of barren bottoms of about one-fourth mile in extent. It appears that Silva Bar has, during this interval, moved westward about one-fourth mile.

This bar, oblong in shape, lies partly in Apalachicola Bay and partly in St. Vincent Sound and is about midway between Green and St. Vincent Points. It measures about three-fourths mile in length by 350 yards in width and has an approximate extent of 100 acres, 69 per cent of which supports very scattering growth of oysters. It lies on about the general level of the contiguous areas and has a depth at mean low water of 5 to 6 feet. The medium-hard bottom is composed of sand and mud.

The oysters are in small to large irregular clusters and shapely singles. At the time of the examination they were fat and in good condition, but were becoming milky. A number of mussels and small barnacles were taken while tonging. At one station near the southwest border, which has very scattering growth, black shells buried in mud and green algæ or sea lettuce were found. At this place the oysters were in only fair condition. Fishing was not carried on extensively on this bar during the survey.

The following tables exhibit the condition of this bed:

## OYSTER GROWTH ON SILVA BAR.

Character of oyster growth.	Area.	Oysters per acre.			Esti- mated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	<i>Acres.</i> 23	<i>Bushels.</i> 39	<i>Bushels.</i> 318	<i>Bushels.</i> 357	<i>Bushels.</i> 8,211
Scattering.....	8	60	138	198	1,584
Very scattering.....	69	13	57	70	4,830
Total.....	100	-----	-----	-----	14,625

## DETAILS OF EXAMINATION OF SILVA BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
1178. . .	Apr. 7	6.5	2.12	0	8.5	8.0	5	91	243	334	Dense.
1179. . .	do.....	7.0	2.04	0	0	9.3	1	0	283	283	Do.
1206. . .	Apr. 8	5.5	2.38	0	2.3	14.1	3	25	429	454	Do.
1107. . .	Apr. 6	6.5	2.12	0.9	4.2	5.7	2	60	138	198	Scattering.
1105. . .	do.....	6.0	2.21	0	.9	2.3	0	12	56	68	Very scattering.
1108. . .	do.....	7.0	2.04	0	1.0	2.4	2	14	58	72	Do.

## 27. FISH HAWK BAR.

It very seldom happens that an oyster reef of any considerable extent remains unknown to the tongers and dealers in a region that is extensively fished. Such, however, was the case with this bar, which was found untouched in its natural condition. It has, apparently, developed on a favorable bottom since the survey made by the Bureau in 1895-96, as it was not mentioned or recorded on the chart of that report. On account of its good size and the excellent quality of the product, the bar is named in honor of the U. S. Fisheries steamer *Fish Hawk*, which was detailed for the survey of these waters and has long been associated with oyster investigations.

The bar, ovate in outline, is located in the extreme western limits of Apalachicola Bay, about 1 mile south of St. Vincent Point and 2 miles north-northeast of West Pass. It measures about five-eighths by one-fourth mile and has an approximate area of 90 acres. The depth at mean low water is 2 to 5 feet, and the elevation on the east and south borders is about 1 foot. The bottom is firm and composed of sand, mud, and scrap shells, and supports about 30 per cent each of dense and scattering growths, 14 per cent very scattering, and 23 per cent depleted bottoms.

Though of small size, the oysters are of good shape and occur as singles or in clusters of two or three. At the time of the investigation they were fat, of good flavor, salty, and in prime condition. It appears that they would serve admirably for shell or barrel stock. Disregarding the nearness to West Pass and the rather high salinity of the waters, no detrimental conditions other than three medium-sized drills and many very small barnacles were observed.

The character of the oyster growth, area, and details of examination of Fish Hawk Bar are given in the following tables:

## OYSTER GROWTH ON FISH HAWK BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	29	272	248	520	15,080
Scattering.....	27	176	92	268	7,236
Very scattering.....	13	131	36	167	2,171
Depleted.....	21	141	12	153	3,213
Total.....	90				27,700

## DETAILS OF EXAMINATION OF FISH HAWK BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
1075...	Mar. 27	5.0	2.55	0	25.9	13.7	9	231	332	563	Dense.
1087...	Apr. 5	5.5	2.38	0	26.9	15.5	4	239	375	614	Do.
1088...	do.	6.0	2.21	0	42.1	8.6	6	375	208	583	Do.
1089...	do.	5.5	2.38	0	32.4	8.4	2	288	203	491	Do.
1090...	do.	6.0	2.21	0	36.6	8.1	5	326	196	522	Do.
1094...	do.	6.0	2.21	0	19.5	7.2	2	173	174	347	Do.
1073...	Mar. 27	6.5	2.12	0	9.9	3.3	2	88	80	168	Scattering.
1074...	do.	6.0	2.21	0	15.8	3.2	1	141	77	218	Do.
1086...	Apr. 5	5.0	2.55	0	38.0	5.5	0	338	133	471	Do.
1093...	do.	6.5	2.12	0	15.5	3.3	2	138	80	218	Do.
1072...	Mar. 27	7.0	2.04	0	14.7	1.5	5	131	36	167	Very scattering.
1092...	Apr. 5	6.0	2.21	0	15.8	.5	5	141	12	153	Depleted.

## 28. PATCH NEAR FISH HAWK BAR.

There is a small dense patch of recent growth situated about one-fourth mile northeast of Fish Hawk Bar. It is nearly circular in outline, having a diameter slightly over 200 yards and an area of 9 acres. The patch has a depth at mean low water of 5 feet and an elevation from a few inches to about 1 foot. The bottom is firm mud and sand. The oysters are in small clusters and of good shape, although some scissor-bills were taken at a tonging station. An examination showed an average of about 168 bushels of seed and 373 bushels of market oysters per acre.

## 29. PATCH OFF SHEEPHEAD BAYOU (ST. VINCENT SOUND).

A small, very scattering patch of 6 acres is situated along the northeast shore of St. Vincent Island, about midway between Paradise and St. Vincent Points. Depth of water is 2 feet; bottom is of sand. The oysters are large and occur in scattering clusters, more or less covered with sea lettuce and green algæ. Some were partly buried in the sand. At the time of the survey they were fat and milky. Many small mussels and a few barnacles were taken. An examina-

tion of the patch showed an average of 6 bushels of seed and 55 bushels of market oysters per acre and a total of 366 bushels for the entire area.

## 30. PARADISE POINT BAR.

This somewhat rectangular-shaped bar of 74 acres is situated in the southeast section of St. Vincent Sound, off Paradise Point. Near the center a dense oval area of 11 acres is found, which is completely surrounded by a broad skirting of depleted bottoms of 63 acres. The depth ranges from  $4\frac{1}{2}$  to 6 feet at mean low water. The bottom, principally of sand with some mud, is hard and has but little elevation.

The oysters are of good size and in small scattering bunches. When this part of the sound was surveyed the oysters were fat and becoming milky. The oysters are usually taken by nipping. Many mus- sels and some barnacles were noted.

The following tables give the results obtained on this bar:

OYSTER GROWTH ON PARADISE POINT BAR.

Character of oyster growth.	Area.	Oysters per acre.			Esti- mated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 11	Bushels. 191	Bushels. 158	Bushels. 349	Bushels. 3,839
Depleted.....	63	2	9	11	693
Total.....	74	.....	.....	.....	4,532

DETAILS OF EXAMINATION OF PARADISE POINT BAR.

Sta- tion.	Date of exami- nation.	Depth of water.	Area cov- ered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Mar- ket.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
1152....	Apr. 7	5.5	2.38	0	0	5.0	1	0	152	152	Dense.
1213....	Apr. 8	6.0	2.21	.....	35.7	5.4	16	383	164	547	Do.
1149....	Apr. 7	7.0	2.04	0	.5	1.0	1	5	30	35	Depleted.
1173....	do.....	5.5	2.38	0	.4	.8	0	4	24	28	Do.
1151....	do.....	5.0	.....	.....	.....	.....	1	.....	.....	.....	Do.
1212....	Apr. 8	6.5	(a)	.....	.....	.....	0	.....	.....	.....	Do.
1214....	do.....	6.0	.....	.....	.....	.....	1	.....	.....	.....	Do.
1215....	do.....	6.5	.....	.....	.....	.....	1	.....	.....	.....	Do.

<sup>a</sup> Hard mud.

## 31. PARADISE FLAT AND ADJACENT LUMP.

This very irregular flat is located off the north shore of St. Vincent Island and slightly east of the center of the sound. It has a length in a northeast-southwest direction of about 1 mile, an average width of 800 yards, and, including the small lump to the northeast, contains an approximate area of 299 acres. Depth of water is 2 to  $4\frac{1}{2}$  feet at mean low tide. The elevation, particularly along the northern limits, varies from a few inches to about 1 foot. The bottom is sand or sand

and mud with occasional buried shells. The bar exhibits all phases of oyster growth from dense areas to depleted bottoms, these two alone embracing about 30 per cent each of the entire bed, while the scattering growth includes about 21 per cent and the very scattering about 17 per cent.

The oysters are large, heavy shelled, of good shape, and occur in small to large clusters. When examined they were fat, in good condition, but becoming milky. Many mussels, some barnacles, and considerable sea lettuce were observed. The oysters are usually taken by nipping or hogging.

Two small patches of very scattering growth southwest of this bed were outlined but were not examined in detail. They are shown on the chart.

The following tables show the character and details of examination of the flat and adjacent lump:

OYSTER GROWTH ON PARADISE FLAT AND ADJACENT LUMP.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	93	28	337	365	33,945
Scattering.....	63	9	101	110	6,930
Very scattering.....	53	9	37	46	2,438
Depleted.....	90	2	0	2	180
Total.....	299				43,493

DETAILS OF EXAMINATION OF PARADISE FLAT AND ADJACENT LUMP.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
1181....	Apr. 8	6.0	2.21	0	1.8	6.8	2	19	207	226	Dense.
1185....	do.	5.0	2.55	0	1.6	5.9	3	17	180	197	Do.
1195....	do.	6.5	2.12	0	.5	15.1	4	5	495	500	Do.
1197....	do.	5.0	2.55	0	0	5.5	1	0	167	167	Do.
1198....	do.	5.0	2.55	0	1.1	5.5	1	12	167	179	Do.
1203....	do.	5.0	2.55	0	2.7	5.9	3	29	180	209	Do.
1296....	Apr. 14	4.0	3.05	0	2.9	8.2	5	31	249	280	Do.
1300....	do.	5.0	2.55	0	.8	10.9	1	9	332	341	Do.
1301....	do.	6.5	2.12	0	15.1	39.2	10	162	1,192	1,354	Do.
1302....	do.	4.5	2.80	0	0	6.5	6	0	198	198	Do.
1190....	Apr. 8	6.0	2.21	0	.5	2.7	1	5	82	87	Scattering.
1196....	do.	5.5	2.38	0	.5	2.8	5	5	85	90	Do.
1201....	do.	3.5	3.35	0	0	2.9	1	0	88	88	Do.
1294....	Apr. 14	3.5	3.35	0	.3	3.6	1	3	110	113	Do.
1297....	do.	5.0	2.55	0	2.4	4.3	39	26	131	157	Do.
1299....	do.	4.5	2.80	0	1.1	3.6	1	12	110	122	Do.
1182....	Apr. 8	6.5	2.12	0	.0	.9	0	0	27	27	Very scattering.
1186....	do.	4.0	3.05	0	.3	1.3	1	3	40	43	Do.
1188....	do.	4.0	3.05	0	3.6	1.9	11	38	58	96	Do.
1199....	do.	4.5	2.80	0	0	1.1	0	0	33	33	Do.
1295....	Apr. 14	3.5	3.35	0	.6	.9	2	6	27	33	Do.
1200....	Apr. 8	4.0	3.05	0	.3	0	2	3	0	3	Depleted.
1202....	do.	4.0	3.05	0	0	0	0	0	0	0	Do.

a Scrap shells.

## 32. HOPPE FLAT.

This body of oysters, forming a broad skirting along the north shore of St. Vincent Sound, begins near Signal Hoppe and extends westward for about  $1\frac{1}{2}$  miles. Its breadth is about 400 yards, and, exclusive of the private claim located within the eastern limits, contains about 151 acres. Depth of water is from 1 to 4 feet, with inshore parts becoming dry or awash at low tide. The bottom is firm and composed of sand, mud, and scraps. A few buried shells were observed in the central section of the bar. The elevation on the outer border is about 1 foot. Both the east and west ends of the bed, comprising about 110 acres, bear scattering growths of oysters; the central portion of 32 acres, very scattering; and the tongue or projection, an area of 9 acres, dense growth.

The oysters are large, occur usually in small clusters, and were found fat and in good condition, but milky. Many mussels, some barnacles, and considerable sea lettuce were taken, especially on the scattering growth.

The following tables point out the character of oyster growth and examination of this bed:

OYSTER GROWTH ON HOPPE FLAT.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	9	171	790	961	8,649
Scattering.....	110	22	117	139	15,290
Very scattering.....	32	11	67	78	2,496
Total.....	151				26,435

DETAILS OF EXAMINATION OF HOPPE FLAT.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	Fect.	Sq. yds.					Bush.	Bush.	Bush.	
1237...	Apr. 12	2.0	4.50	0	16.0	26.0	0	171	790	961	Dense.
1216...	do.....	3.5	3.35	0	2.7	4.8	3	39	145	185	Scattering.
1232...	do.....	4.5	2.80	0	.7	4.0	6	7	121	128	Do.
1233...	do.....	2.0	4.50	0	2.9	3.1	2	31	94	125	Do.
1236...	do.....	4.5	2.80	0	1.1	3.6	3	12	109	121	Do.
1231...	do.....	4.5	2.80	0	1.0	2.2	5	11	67	78	Very scattering.

## 33. HOPPE OR TEN-MILE BAR.

This small dense area of 9 acres is situated near the center of St. Vincent Sound and lies equidistant from Paradise Flat and Bayou Bar on the south and Hoppe Flat on the north. At mean low water



it has a depth of about  $3\frac{1}{2}$  feet. The rather firm bed consists of blue mud and sand and is surrounded by a soft bottom. A station off the north end of the bar revealed a penetration of 11 feet with the testing pole.

The oysters are good shaped and in small clusters. At the time of the investigation they were fresh, fat, and milky. An examination of this bar showed about 24 bushels of oysters under 3 inches and 155 bushels of large ones per acre.

#### 34. SUTERS LUMPS.

Situated between Bayou Bar and Hoppe Flat are three small lumps totaling 7 acres. Two have dense and the other very scattering growths of oysters. These patches were not examined in detail, but their location is indicated on the chart.

#### 35. BAYOU BAR.

Beginning with a skirting of very scattering growth of oysters along the north shore of St. Vincent Island just east of the entrance to Big Bayou, this bar ranges northward for upward of a half mile, then bears to the east for about three-fourths mile in three tolerably well-defined arms. Its greatest width is approximately 500 yards, and its extent is about 177 acres. The depth of water at mean low tide is from 2 feet inshore to about 4 feet at the northern margin. The bed is only fairly well raised above the immediate floor and will hardly average 6 inches for its entire perimeter. The bottom is hard and consists principally of sand and mud with some scraps. The dense area lying to the eastward comprises about 60 per cent; scattering growth, in two small sections, 13 per cent; and very scattering, the connecting link between the main body and the island shore, about 26 per cent of the bar.

The oysters are very large and occur singly or in small clusters. When inspected they were fat, fresh, milky, and growing rapidly. Mussels, barnacles, and sea lettuce were found at nearly every station.

The acreage, character of growth, and details of examination are shown in the following tables:

OYSTER GROWTH ON BAYOU BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	106	16	235	251	26,606
Scattering.....	24	7	94	101	2,424
Very scattering.....	47	0	73	73	3,431
Total.....	177				32,461

## DETAILS OF EXAMINATION OF BAYOU BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
1220...	Apr. 12	4.5	2.80	0	1.5	9.5	4	16	289	305	Dense.
1293...	Apr. 14	4.0	3.05	0	2.9	7.2	3	31	219	250	Do.
1303...	do.....	4.5	2.80	0	0	6.5	6	0	198	198	Do.
1229...	Apr. 12	4.0	3.05	0	.7	3.3	4	7	100	107	Scattering.
1304...	Apr. 14	4.0	3.05	0	.7	2.9	1	7	88	95	Do.
1292...	do.....	3.5	3.35	0	0	2.4	1	0	73	73	Very scattering.

That portion of the north shore of St. Vincent Island reaching from Big Bayou to St. Vincent Point, a distance of about 5 miles, has a firm bottom generally and usually clear and comparatively shallow water, with here and there scattering bunches of good oysters. When practicable; these grounds and adjacent bars are fished by nipping or by wading. It was stated that the work is often pursued by day in a flatboat or light-draft vessel, the product then taken to near-by oyster boats and culled at night; and also that under favorable conditions two men can gather from 12 to 15 barrels of oysters per day by these methods.

## 36. PATCHES OFF BIG BAYOU.

A small circular patch of dense growth of oysters is situated about three-fourths mile north of Big Bayou. This patch contains about 3 acres, the bottom is hard and fairly well raised above the neighboring grounds, and the depth is about 3 feet at mean low water. The oysters were good shaped, in small clusters, and were fat, fresh, and milky. An examination showed 10 bushels of seed and 228 bushels of marketable product per acre.

A small area about midway between the above patch and Big Bayou had a bottom composed of mud and dead shells; depth of water, about 4 feet.

A lump of limited extent and bearing very scattering growth is located about one-half mile west of the above area and 200 yards offshore; depth of water, 3 feet. No examination was made on this lump, but its position is indicated on the chart.

## 37. HALF MOON BAR.

This bed of 122 acres lies off the mainland or northern shore of St. Vincent Sound and 1 mile northwest of Bayou Bar. Its length in an east and west direction is about  $1\frac{1}{4}$  miles, and its greatest width is about 400 yards; depth of water, 2 to  $3\frac{1}{2}$  feet. The bottom varies from hard to medium, the eastern portion is largely sand, and the remainder is mud and sand. Some stations showed a slight deposit of yellow mud on top.

The oysters are, for the most part, large, deep, and occur in small clusters or as singles. The dense growth, comprising about 61 per cent of the total area, occupies the western portion of the bar. The scattering growth and depleted bottoms, of about 17 and 21 per cent, respectively, are found at the eastern section. At the time of the inspection the oysters were fat, fresh, and milky. Sea lettuce was observed at some stations.

The acreage, character of growth, and details of examination are shown in the following tables:

OYSTER GROWTH ON HALF MOON BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	75	26	262	288	21,600
Scattering.....	21	7	109	116	2,436
Depleted.....	26	0	12	12	312
Total.....	122				24,348

DETAILS OF EXAMINATION OF HALF MOON BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
		<i>Feet.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
1250...	1915. Apr. 12	5.5	2.38	0	2.1	6.3	4	22	192	214	Dense.
1254...	do.....	4.5	2.80	0	2.9	10.9	1	31	332	363	Do.
1251...	do.....	5.0	2.55	0	0.8	3.9	0	9	118	127	Scattering.
1253...	do.....	4.5	2.80	0	0.4	3.3	2	4	100	104	Do.
1252...	do.....	4.5	2.80	0	0	.4	0	0	12	12	Depleted.

## 38. SHELL BANK BAR.

This long sinuous bar begins in the shallow water along the north shore of the sound near Signal Tree and extends south and south-east for about  $1\frac{1}{4}$  miles. The greater part is very narrow, the crest or top of which consists of small bars dry or awash at low tide. The easternmost extremity broadens to a nearly circular outline with a breadth of about one-fourth mile. The entire area is about 129 acres. It is separated from Picoline Bar by a channel known locally as Big Gully, which has a depth of 26 to 29 feet. The hard, clean bottom is composed principally of sand, shell gravel, and shells, and depth of water ranges from a few inches to about 6 feet.

The oysters are large, of good shape, generally deep, and occur in small clusters or as singles. When examined they were fat and

milky. Very few mussels and barnacles were noted, although some of the older shells contained a number of the boring clam *Martesia*.

An average of five stations made on this bar gave the following results: 34 bushels of oysters under 3 inches and 358 bushels over 3 inches per acre. The bar has dense growth throughout.

#### DETAILS OF EXAMINATION OF SHELL BANK BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
1255...	Apr. 12	6.5	2.12	0	4.7	11.8	3	50	358	408	Dense.
1256...	...do....	7.5	2.04	0	2.4	5.4	19	26	164	190	Do.
1260...	...do....	5.0	2.55	0	4.3	18.4	11	46	559	605	Do.
1288...	Apr. 13	1.5	1.0	0	2.0	13.0	20	21	395	416	Do.
1306...	Apr. 14	6.5	2.12	0	2.4	10.4	14	25	316	341	Do.

#### 39. PICOLINE BAR.

Picoline Bar is situated in the southwestern section of St. Vincent Sound, about 3 miles east of Indian Pass. No detailed examination was made on this bar, but its position is shown on the chart. It consists principally of shallow reefs extending northward from St. Vincent Island to the Big Gully. Both on the east and west it is delimited by private claims. The present limits are about one-half mile in length by 300 yards in width, having an approximate area of 48 acres. The margins along the northeast and northwest portions have a depth of about 4 feet and a hard bottom of sand and scrap shells, but no oysters. The top has dense growth. Formerly this bar was a bed of dead oysters.

#### 40. CEDAR SHELL BANK BAR.

This consists of two shallow bars reaching southward from the mainland, about 2 miles east of Indian Pass. The western and upper third of the eastern extensions bear dense growth, consisting mostly of clusters of the shallow-bar type and generally of scrawny appearance. However, some singles are of fine shape.

A station made by wading on the lower end of the west reef revealed a hard bottom, with 14 small oysters, 21 from 3 to 4 inches in length, and 98 large ones, and 10 shells per square yard. Sea lettuce and a few mussels were observed. When examined the oysters were fat and milky.

The lower two-thirds of the east reef supports scattering growth. A station near the center of this section, in a depth of 3 feet and on a medium-hard bottom, gave the following results: 0.3 culls, 3.6

counts, and 1 shell per square yard. On this part of the bar the oysters were mostly good-shaped singles; they were fat and milky. The bar contains about 48 acres.

#### REVIEW OF THE NATURAL OYSTER BEDS.

The entire water area surveyed, from signals Marsh and Spartan to Indian Pass, contains about 130 square miles. In this district there were found and definitely located about 40 productive oyster bars, having an extent of about 7,135 acres, or 11.1 square miles, or nearly one-twelfth of the area surveyed.

In St. George Sound the ratio of beds to the part surveyed is, approximately, 1 to 6; in Apalachicola Bay the ratio is about 1 to 19, and in St. Vincent Sound it is about 1 to 10. Of the three bodies of water it is therefore evident that St. George Sound is the most advantageously situated as far as acreage of oyster beds is concerned and Apalachicola Bay the least so.

In St. George Sound the beds are rather indiscriminately located, but the larger ones are found along the western margin. The best beds are Porter, East Hole, and parts of Platform Bars.

In Apalachicola Bay the major portion of the beds are crowded in the western limits, where excellent stock is found, and in St. Vincent Sound the beds are for the most part situated along the southeastern shore and central portions.

About two-thirds of the total area of oyster bottom is classed as dense growth, the remaining part is about equally divided among scattering, very scattering growths, and depleted bottoms. Dense growth occupies somewhat more than 80 per cent of the oyster area in St. George Sound and about 50 per cent each in Apalachicola Bay and St. Vincent Sound. Scattering growth covers approximately 5 per cent, 11 per cent, and 21 per cent in the three bodies of water, respectively, while the per cent of surface for very scattering is about 6, 23, and 13, and for depleted bottoms it is about 5, 14, and 17, respectively.

The chart which accompanies this report shows the location and character of the beds, and the following table classifies the growth for each of the larger beds and for groups of the smaller patches.

## SUMMARIZED STATEMENT OF AREAS OF MARKET OYSTERS ON PUBLIC BEDS.

Name of bed.	Character of oyster growth.				Total.
	Dense.	Scatter- ing.	Very scat- tering.	Depleted.	
ST. GEORGE SOUND.					
	Acres.	Acres.	Acres.	Acres.	Acres.
1. Goose Island Bar.....	24		126		150
2. Silvia Bar.....	57	4	8		69
3. Drum Bar.....	81			30	111
4. Sand Flat.....	20	20			40
5. Pelican Bar.....	69	17	6	5	97
6. North Lump.....		5		5	10
7. Green Point Bar and adjacent patch.....	21	9	17	10	57
8. Platform Bar.....	332		5	2	339
9. Porter Bar.....	114	9	25	112	260
10. Peanut Patch.....	123				123
11. Cat Point Bar.....	686	102		6	794
12. Bulkhead and East Hole Bars.....	1,322	12	30	15	1,379
13. Patches east of Bulkhead and East Hole Bars.....	5				5
APALACHICOLA BAY.					
14. Pelican Bar.....	91		110	97	298
15. Patches between East Hole and Pelican Bars.....	38	5			43
16. East Lumps.....	168	4	24	28	224
17. Norman Bar.....	45				45
18. Thigpen Bar.....	4				4
19. West Lump and adjacent patch.....	75	11	5		91
20. Patch off New Inlet.....	5				5
21. Hagen Flat.....	54	8			62
22. Green Point Flat.....	170				170
23. Lumps between Hagen and Green Point Flats.....	22		3		25
24. St. Vincent Bar.....	585	218	391	220	1,414
25. Middle Bar.....	48				48
26. Silva Bar.....	23	8	69		100
27. Fish Hawk Bar.....	29	27	13	21	90
28. Patch near Fish Hawk Bar.....	9				9
ST. VINCENT SOUND.					
29. Patch off Sheephead Bayou.....			6		6
30. Paradise Point Bar.....	11			63	74
31. Paradise Flat and adjacent lump.....	93	63	53	90	299
32. Hoppe Flat.....	9	110	32		151
33. Hoppe or Ten-Mile Bar.....	9				9
34. Suters Lumps.....	5		2		7
35. Bayou Bar.....	106	24	47		177
36. Patches off Big Bayou.....	3				3
37. Half Moon Bar.....	75	21		26	122
38. Shell Bank Bar.....	129				129
39. Picoline Bar.....	48				48
40. Cedar Shell Bank Bar.....	39	9			48
Total.....	4,747	686	972	730	7,135

The following table shows the character of oyster growth and yield in standard United States bushels for the various bars. The classification, as is explained on page 11, is based on the relative abundance of oysters over 3 inches long, which is assumed to be the minimum size that could be used for market purposes. The smaller oysters, while recorded and elsewhere discussed, do not enter in any way into the classification. Neither does the term "dense" mean a continuous cover of massed oysters. It is used to express the condition where oysters in excess of 150 bushels per acre are found on the bottom, lying on the mud or sand, either as a continuous growth or in separated clusters.

It may be stated that, as a rule, only those oysters having a length of 4 inches or over were taken to market by the tongs; those under

that length were considered as culls. The unit of measure used by those engaged in the industry is the Florida tub, or so-called "bushel," which contains about 2.2 bushels. If based on these data—the Florida bushel and 4-inch oyster—the yield per acre and per bar would be materially less than that determined according to the classification and measurements mentioned above.

The table shows an average of 368 bushels of marketable oysters per acre for the entire area of oyster beds in the district and an average of about 525 bushels per acre for the dense growth. Exclusive, however, of Bulkhead and East Hole Bars, the average for the entire oyster area drops to 274 bushels.

## SUMMARIZED CONTENT OF MARKET OYSTERS ON PUBLIC BEDS.

Name of bed.	Character of oyster growth.				Total.
	Dense.	Scatter- ing.	Very scat- tering.	Depleted.	
ST. GEORGE SOUND.					
	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
1. Goose Island Bar.....	8,592		7,308		15,900
2. Silvia Bar.....	19,209	416	536		20,161
3. Drum Bar.....	27,216			360	27,576
4. Sand Flat.....	4,620	2,300			6,920
5. Pelican Bar.....	31,257	2,210	276	105	33,848
6. North Lump.....		725			725
7. Green Point Bar and adjacent patch.....	4,074	1,188	1,139	200	6,601
8. Platform Bar.....	222,772		90		222,862
9. Porter Bar.....	28,272	1,026	1,175	2,800	33,273
10. Peanut Patch.....	67,281				67,281
11. Cat Point Bar.....	324,478	11,628		126	336,232
12. Bulkhead and East Hole Bars.....	1,043,058	1,344	1,590	195	1,046,187
13. Patches east of Bulkhead and East Hole Bars.....	1,440				1,440
APALACHICOLA BAY.					
14. Pelican Bar.....	53,053		5,720	291	59,064
15. Patches between East Hole and Pelican Bars.....	17,024	500			17,524
16. East Lumps.....	76,104	308	1,296		77,708
17. Norman Bar.....	23,220				23,220
18. Thigpen Bar.....	1,020				1,020
19. West Lump and adjacent patch.....	31,875	1,386	310		33,571
20. Patch off New Inlet.....	980				980
21. Hagen Flat.....	34,236	752			34,988
22. Green Point Flat.....	70,380				70,380
23. Lumps between Hagen and Green Point Flats.....	10,296		78		10,374
24. St. Vincent Bar.....	221,130	24,634	19,550	3,740	269,054
25. Middle Bar.....	19,008				19,008
26. Silva Bar.....	7,314	1,104	3,933		12,351
27. Fish Hawk Bar.....	7,192	2,484	468	252	10,396
28. Patch near Fish Hawk Bar.....	3,357				3,357
ST. VINCENT SOUND.					
29. Patch off Sheephead Bayou.....			330		330
30. Paradise Point Bar.....	1,738			567	2,305
31. Paradise Flat and adjacent lump.....	31,341	6,363	1,961		39,665
32. Hoppe Flat.....	7,110	12,870	2,144		22,124
33. Hoppe or Ten-Mile Bar.....	1,395				1,395
34. Suters lumps <sup>a</sup> .....					
35. Bayou Bar.....	24,910	2,256	3,431		30,597
36. Patches off Big Bayou.....	684				684
37. Half Moon Bar.....	19,650	2,289		312	22,251
38. Shell Bank Bar.....	46,182				46,182
39. Picoline Bar <sup>a</sup> .....					
40. Cedar Shell Bank Bar <sup>a</sup> .....					
Total.....	2,491,468	75,783	51,335	8,948	2,627,534

<sup>a</sup> Detailed examination was not made over the entire bar.

With reference to quantity, the small oysters, or those under 3 inches long, are about one-fifth that of the market stock, but numerically they are about twice as numerous as the market stock.

## SUMMARIZED CONTENT OF YOUNG OYSTERS ON PUBLIC BEDS.

Name of bed.	Character of oyster growth.				Total.
	Dense.	Scatter- ing.	Very scatter- ing.	De- pleted.	
ST. GEORGE SOUND.					
	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
1. Goose Island Bar.....	2,760		3,024		5,784
2. Silvia Bar.....	7,752	660	32		8,444
3. Drum Bar.....	8,748			960	9,708
4. Sand Flat.....	1,540	1,540			3,080
5. Pelican Bar.....	6,693	1,802	180	95	8,770
6. North Lump.....		405		35	440
7. Green Point Bar and adjacent patch.....	2,226	216	357	210	3,009
8. Platform Bar.....	36,852				36,852
9. Porter Bar.....	10,716	477	300	3,024	14,517
10. Peanut Patch.....	17,220				17,220
11. Cat Point Bar.....	53,508	4,080		378	57,966
12. Bulkhead and East Hole Bars.....	158,640	696	1,170	195	160,701
13. Patches east of Bulkhead and East Hole Bars.....	545				545
APALACHICOLA BAY.					
14. Pelican Bar.....	10,556		6,380	970	17,906
15. Patches between East Hole and Pelican Bars.....	2,850	300			3,150
16. East Lumps.....	17,136	72	1,056		18,264
17. Norman Bar.....	2,745				2,745
18. Thigpen Bar.....	324				324
19. West Lump and adjacent patch.....	5,325	319			5,644
20. Patch off New Inlet.....	175				175
21. Hagen Flat.....	5,346	200			5,546
22. Green Point Flat.....	17,850				17,850
23. Lumps between Hagen and Green Point Flats.....	1,232		18		1,250
24. St. Vincent Bar.....	39,780	5,886	6,256	6,380	58,302
25. Middle Bar.....	2,352				2,352
26. Silva Bar.....	897	480	897		2,274
27. Fish Hawk Bar.....	7,888	4,752	1,703	2,961	17,304
28. Patch near Fish Hawk Bar.....	1,512				1,512
ST. VINCENT SOUND.					
29. Patch off Sheephead Bayou.....			36		36
30. Paradise Point Bar.....	2,101			126	2,227
31. Paradise Flat and adjacent lump.....	2,604	567	477	180	3,828
32. Hoppe Flat.....	1,539	2,420	352		4,311
33. Hoppe or Ten-Mile Bar.....	216				216
34. Suters Lumps <sup>a</sup> .....					
35. Bayou Bar.....	1,696	168			1,864
36. Patches off Big Bayou.....	30				30
37. Half Moon Bar.....	1,950	147			2,097
38. Shell Bank Bar.....	4,386				4,386
39. Picoline Bar <sup>a</sup> .....					
40. Cedar Shell Bank Bar <sup>a</sup> .....					
Total.....	437,690	25,187	22,238	15,514	500,629

<sup>a</sup> Detailed examination was not made over the entire bar.

For some phase of the growth, from dense areas to depleted bottoms, small oysters were in numerical preponderance on only about 45 per cent of the beds. Of these the greater number were in St. George Sound. At the time of the survey spat for the season had not set, which, of course, would reduce the proportion of the young. On those beds, however, where large oysters predominated the small size were in sufficient numbers to perpetuate the beds under present conditions, unless depleted by physical accidents, such as storms,



freezes, or deposits of silt and sand, all of which have occurred on some bars during the history of the local fishery.

Among the beds which appear to be the least provided with young stock are Platform Bar and Peanut Patch in St. George Sound; Norman, West Lump, Hagen Flat, Green Point Flat, Middle, and Silva Bars in Apalachicola Bay, and the greater number of bars in St. Vincent Sound.

From the table it appears that the following beds are extending their productive areas by improvement of the very scattering growths and depleted bottoms: Drum, Pelican, Green Point, Porter, Cat Point, Bulkhead, and East Hole Bars in St. George Sound, and Pelican, St. Vincent, and Fish Hawk Bars in Apalachicola Bay.

NUMBER OF OYSTERS UNDER THREE INCHES LONG FOR EACH ONE OVER THAT LENGTH ON THE SEVERAL BEDS.

Name of bed.	Character of oyster growth.			
	Dense.	Scatter- ing.	Very scatter- ing.	De- pleted.
ST. GEORGE SOUND.				
1. Goose Island Bar.....	0.9		1.1	
2. Silvia Bar.....	1.1	2.9	.7	
3. Drum Bar.....	.9			7.5
4. Sand Flat.....	.9	1.8		
5. Pelican Bar.....	.6	2.3	1.8	8.3
6. North Lump.....		1.6		(a)
7. Green Point Bar and adjacent patch.....	1.5	.5	1.8	2.8
8. Platform Bar.....	.5		(b)	
9. Porter Bar.....	1.3	1.7	1.5	4.0
10. Peanut Patch.....	.8			
11. Cat Point Bar.....	.5	1.2		8.9
12. Bulkhead and East Hole Bars.....	.4	1.6	3.1	3.0
13. Patches east of Bulkhead and East Hole Bars.....	1.4			
APALACHICOLA BAY.				
14. Pelican Bar.....	.6		4.3	10.2
15. Patches between East Hole and Pelican Bars.....	.5	2.0		
16. East Lumps.....	.6	.7	2.2	
17. Norman Bar.....	.4			
18. Thigpen Bar.....	.9			
19. West Lump and adjacent patch.....	.5	.6	(b)	
20. Patch off New Inlet.....	.4			
21. Hagen Flat.....	.3	.7		
22. Green Point Flat.....	.6			
23. Lumps between Hagen and Green Point Flats.....	.3		.5	
24. St. Vincent Bar.....	.2	.5	.6	3.8
25. Middle Bar.....	.3			
26. Silva Bar.....	.3	.9	.4	
27. Fish Hawk Bar.....	3.0	5.2	9.8	31.6
28. Patch near Fish Hawk Bar.....	.9			
ST. VINCENT SOUND.				
29. Patch off Sheephead Bayou.....			.3	
30. Paradise Point Bar.....	3.4			.5
31. Paradise Flat and adjacent lump.....	.2	.2	.7	(a)
32. Hoppe Flat.....	.6	.5	.5	
33. Hoppe or Ten-Mile Bar.....	.4			
34. Suters Lumps.....				
35. Bayou Bar.....	.2	.2	(b)	
36. Patches off Big Bayou.....	.1			
37. Half Moon Bar.....	.3	.2		(b)
38. Shell Bank Bar.....	.3			
39. Picoline Bar.....				
40. Cedar Shell Bank Bar.....	.1	.1		

a No large.

b No small.

b Detailed examination was not made over the entire bar.

### BARREN BOTTOMS.

The area of barren bottoms—that is, those which are not naturally productive of oysters even in small quantities—vastly exceeds that of the natural beds, including in the latter those so-called depleted areas which bear practically nothing. These bottoms are barren, mainly because of one character in which they differ from the productive areas—namely, that they are devoid of shells or other objects lying on the surface. They consist of sand and mud of varying degrees of stability and consistency. Oysters, immediately after they develop from the egg, for a brief period swim or float freely in the water, settling to a fixed condition only after they reach a stage of considerable development.<sup>a</sup>

It is not necessary to give more detail to this subject other than to say that at the time at which they are undergoing fixation the oysters are very minute, and a slight film of mud or slime is sufficient to stifle them. During the spawning season these little organisms are present in the water in untold myriads and are precipitated to the bottom in a continuous gentle drizzle of tiny specks. If they fall on an oyster bed they find firm supports on the shells and oysters, attach themselves and grow, but if they fall on the mud or bare sand they die.

The natural beds have been slowly developed on bottom similar to that which surrounds them solely because through some agency there originally lodged on the mud or sand some hard objects to which the young oysters could safely cling. Oysters developing there and their shells scattered about by the waves furnished additional places for fixation of new generations of young, with the result that the original growth extended in area and its bed became a compact mass of shells and fragments, beneath which can still be found by excavation or probing the original bottom differing in no essential particular from the adjacent barren areas.

All that is required by the barren bottom in order that it may become productive is that its surface should be supplied with hard objects or cultch, either through natural agencies or by the hand of man. The capacity of the bottom to sustain material deposited on it and to maintain it in proper condition to serve as cultch depends largely on its stability and consistency. Moving sands gradually cover objects deposited on their surface and soft mud permits them to sink. It is therefore of prime importance for the oyster culturist to have information concerning the character of the bottom, and it was one of the purposes of the survey to supply it.

The methods and the instrument employed have been described in the introductory part of this report, and the results attained are shown graphically on the chart.

<sup>a</sup> For a more extended account see "Oysters and methods of oyster culture," by H. F. Moore, Bureau of Fisheries document no. 349, which may be obtained by application to the Bureau at Washington, D. C.

The symbols on the chart designating the character of the bottom do not show all of the places at which examinations were made, but only those which have been selected as representative of the general conditions obtaining in the vicinity. It may be assumed that between any two adjacent symbols of different significance the change in the character of the bottom is more or less gradual.

The large number of soundings and bottom testings made during the course of the survey furnish valuable data for the determination of the character of the floor of the entire district. About 119 square miles, or 91 per cent of the region, exclusive of the depleted grounds of or adjacent to the recognized oyster reefs, consist of unoystered areas.

Of the productive portion of St. George Sound the eastern half has for the most part a firm hard bottom suitable for the development of oyster beds. The depth of water in this section is about 9 feet at mean low level. In certain portions, however, as between Porter and Green Point Bars and for some distance to the eastward of the latter bar, the bottom varies in quality from very soft to stiff mud and is unfavorable for the planting of shells or other cultch. The western half of the sound, barring the shore line, has generally very soft bottoms. Between Porter and Cat Point Bars and south of Peanut Patch there are stretches having ooze. Hard or stiff mud bottoms are found east of Drum Bar, between Silvia and Porter Bars, and northeast of signal Bulkhead.

With the exception of the margins, the greater portion of Apalachicola Bay has many soft or ooze bottoms. At a station west of St. Vincent Bar the testing pole recorded a depth of 8 feet of mud. Good firm bottoms are found on a small area west of Cat Point Bar, an extended section (of which a part was a bed of dead shells when examined by the Bureau 20 years ago) west and northwest of Pelican Bar, a stretch off signal Scaffold, a portion south of Green Point, a stiff mud area east of St. Vincent Bar, and a series of small patches northeast of West Pass. Depth of water ranges from 5 to 10 feet.

The eastern half of St. Vincent Sound has rather soft bottoms, but the western division is hard, firm, and more or less covered with scrap shells.

The location of barren bottoms which appear to be suitable for the development and culture of oysters may be approximately determined by consulting the chart.

## GENERAL PHYSICAL AND BIOLOGICAL CONDITIONS.

### TIDES AND CURRENTS.

In order to reduce the great number of soundings made during the survey to approximate mean low-water level, four widely separated tide-gauge stations, consisting of plain staffs graduated in feet and

tenths, were established and maintained for all or part of the time. One station was located at Cat Point (East Point, Fla.) from January 16 to April 9; the second station was at Apalachicola, Fla., from January 21 to April 15; the third on St. Vincent Island near West Pass from March 23 to April 16; the fourth at the camps along the north shore of St. Vincent Sound from April 2 to 20. The readings were made hourly from 8 a. m. to 5 p. m., excepting at the Apalachicola station, which was read every hour, day and night, from its establishment until the last of February, then the same as for the other stations for the remainder of the period.

At the Cat Point station the highest tide recorded was on February 23, when the water stood at 5.8 feet on the gauge, and the lowest was on January 29, when it fell to 1 foot, a maximum range of 4.8 feet. At Apalachicola on the same dates there was a range of 4.1 feet, but on February 1, from 3 to 4 a. m., the water reached a height of 6.8 feet, and on February 8, from 5 to 6 a. m., it stood at 2.4 feet, making a range of 4.4 feet. The West Pass station showed a maximum range of 1.8 feet and the camp stations about 2 feet. The mean range of tide was 1.5 feet for all stations, except West Pass, which was 1 foot.

The daily ebb and flow of the tide, though often augmented by high winds, is sufficiently strong to afford satisfactory currents for transporting food and oxygen to the oysters.

#### SALINITY AND TEMPERATURE OF THE WATER.

The connections or entrances at the eastern end of St. George Sound, West and Indian Passes, afford ample means for the comingling of the waters from the Gulf of Mexico with the fresh water brought down by the Carrabelle, Apalachicola, St. Marks, and other affluents. Throughout the entire district surveyed there was a marked range in the degree of salinity, which varied from almost fresh water suitable for drinking purposes to that nearly equal to open-sea water. At times, especially during ebb tide, together with freshets and favorable winds, the salinity was greatly reduced in certain sections. Early in the survey it was noted that comparatively fresh muddy water from East Bay overlapped the heavier clear salt water and extended for some distance east or west of that bay, depending largely on the direction of the wind before becoming thoroughly mixed. In this way the oyster beds are supplied with food, as it appears to be carried for many miles. If the direction of the currents be eastward, Cat Point and Porter Bars may have food-bearing waters spreading over them for some time before Bulkhead and East Hole Bars.

The character and quality of the oyster, as well as the presence or absence of certain enemies, are governed largely by the amount of

salt in solution. This mollusk thrives best in brackish water, having a mean between fresh (specific gravity 1.000) and open-sea water (specific gravity about 1.025). Either extreme, if continued, is decidedly injurious, if not fatal. Waters of rather high salinity are more favorable for drills or conchs, while mussels thrive in waters of low salt content.

For the purpose of determining the general character of the waters, two separate but simultaneous series of observations of salinity and temperature were carefully made. From the *Fish Hawk* the work was performed by the quartermasters at 6 a. m., noon, and 6 p. m., daily throughout the survey.

The vessel was first anchored off Cat Point, remaining there until the latter part of February; then off Jetty Beacon for about one month; next, in southwestern part of Apalachicola Bay for about a week; and, finally, near the second anchorage until the completion of the survey. The biological party conducted the other series, which covered all parts of the region surveyed, including stations on the oyster bars and on unproductive grounds.

The water bottle, or apparatus used for collecting the samples, is so constructed that it secures a uniform amount of water in every case from the layer a few inches above the bottom of the sound, regardless of the depth. This instrument is illustrated and described in "Volumetric studies of the food and feeding of oysters," by H. F. Moore (Bulletin Bureau of Fisheries, vol. xxviii, p. 1297-1308).

The following table furnishes a summary of the two series of observations. The boldface type shows the data and location of the *Fish Hawk*; the other type, that of the biological party.

SALINITY AND TEMPERATURE OBSERVATIONS IN ST. GEORGE SOUND, APALACHICOLA BAY, AND ST. VINCENT SOUND.

Locality.	Date.	Water temperature.			Specific gravity.		
		Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.
	1915.	°F.	°F.	°F.			
<b>Fish Hawk, off Cat Point...</b>	Jan. 12-15.....	<b>59</b>	<b>48.2</b>	<b>53.2</b>	<b>1.0088</b>	<b>1.0026</b>	<b>1.0054</b>
<b>Fish Hawk, off Cat Point...</b>	Jan. 16-23.....	<b>60.8</b>	<b>51.8</b>	<b>56.7</b>	<b>1.0093</b>	<b>1.0006</b>	<b>1.0053</b>
Eastern end of St. George Sound.	.....do.....	57.2	51.8	54.8	1.0190	1.0036	1.0113
<b>Fish Hawk, off Cat Point...</b>	Jan. 24-31.....	<b>59</b>	<b>53.6</b>	<b>58</b>	<b>1.0097</b>	<b>1.0041</b>	<b>1.0062</b>
Vicinity of Porter and Platform Bars.	.....do.....	55.4	51.8	54.4	1.0088	1.0019	1.0056
<b>Fish Hawk, off Cat Point...</b>	Feb. 1-5.....	<b>60.8</b>	<b>53.6</b>	<b>59.4</b>	<b>1.0089</b>	<b>1.0014</b>	<b>1.0045</b>
East of Cat Point and Bulkhead Bars.	.....do.....	60.8	53.6	56.3	1.0053	1.0004	1.0020
<b>Fish Hawk, off Cat Point...</b>	Feb. 6-10.....	<b>60.8</b>	<b>53.6</b>	<b>56.9</b>	<b>1.0032</b>	<b>1.0010</b>	<b>1.0019</b>
Vicinity of East Hole, Cat Point, and East Bay.	.....do.....	54.5	50	52.9	1.0082	1.0001	1.0025
<b>Fish Hawk, off Cat Point...</b>	Feb. 11-17.....	<b>60.8</b>	<b>54.5</b>	<b>56.9</b>	<b>1.0095</b>	<b>1.0025</b>	<b>1.0053</b>
Vicinity of Drum, Platform, and Cat Point Bars.	.....do.....	59.9	53.6	57.7	1.0139	1.0022	1.0070
<b>Fish Hawk, off Cat Point...</b>	Feb. 18-22.....	<b>60.8</b>	<b>55.4</b>	<b>58</b>	<b>1.0220</b>	<b>1.0053</b>	<b>1.0158</b>
Vicinity of Pelican Bar, and east part of Apalachicola Bay.	.....do.....	58.1	57.2	57.4	1.0218	1.0097	1.0172

## SALINITY AND TEMPERATURE OBSERVATIONS IN ST. GEORGE SOUND, APALACHICOLA BAY, AND ST. VINCENT SOUND—Continued.

Locality.	Date.	Water temperature.			Specific gravity.		
		Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.
<b>Fish Hawk, off Jetty Beacon.</b>	1915.	° F.	° F.	° F.			
Eastern part of Apalachicola Bay.	Feb. 23-28.....	60.8	57.2	59.4	1.0220	1.0114	1.0176
<b>Fish Hawk, off Jetty Beacon.</b>	.....do.....	59	56.3	57.5	1.0160	1.0117	1.0133
Vicinity of Norman Bar, East Bay.	Mar. 1-6.....	60.8	53.6	57	1.0158	1.0069	1.0119
<b>Fish Hawk, off Jetty Beacon.</b>	.....do.....	60.8	53.6	56.8	1.0152	1.0068	1.0097
Vicinity of Apalachicola.....	Mar. 7-15.....	57.2	51.8	54.7	1.0189	1.0077	1.0135
<b>Fish Hawk, off Jetty Beacon.</b>	.....do.....	57.2	55.4	56.6	1.0177	1.0038	1.0082
Central part of Apalachicola Bay.	Mar. 16-22.....	60.8	53.6	57.2	1.0210	1.0119	1.0174
<b>Fish Hawk, at Lower Anchorage.</b>	.....do.....	57.2	55.4	56.6	1.0228	1.0177	1.0209
Western part of Apalachicola Bay.	Mar. 23-28.....	59	55.4	57	1.0242	1.0077	1.0183
<b>Fish Hawk, off Jetty Beacon.</b>	.....do.....	62.6	55.4	60.3	1.0246	1.0149	1.0208
Western part of Apalachicola Bay.	Mar. 29-Apr. 5....	62.2	53.6	58.3	1.0198	1.0050	1.0120
<b>Fish Hawk, off Jetty Beacon.</b>	.....do.....	59	57.2	58.1	1.0156	1.0118	1.0137
Eastern part of St. Vincent Sound.	Apr. 6-11.....	68	53.6	59.4	1.0190	1.0109	1.0151
<b>Fish Hawk, off Jetty Beacon.</b>	.....do.....	64.4	60.8	62.7	1.0204	1.0067	1.0115
Central and western part of St. Vincent Sound.	Apr. 12-15.....	71.6	57.2	64.9	1.0188	1.0061	1.0121
	.....do.....	76.1	68	71	1.0219	1.0074	1.0102

The table shows that the average water temperature in Apalachicola Bay, as determined by the observations taken on the *Fish Hawk*, ranged from 53.2° F. in the middle of January to 64.9° F. in the middle of April, a gradual increase of 11.7° during the interval. Also, the lowest temperature observed was 48.2° F., off Cat Point in January, and the highest 76.1° F., in rather shallow water at the western borders of St. Vincent Sound during the middle of April, showing a change of 27.9°.

During the early part of February a very low salinity observation (1.0001) was made near the eastern limits of Apalachicola Bay, and during the latter part of March, in the western part of the same body of water, an observation revealed a high salt content (1.0246). As has been mentioned, these extremes continue for very short periods only. The general average salinity is satisfactory and within the limits of safety.

## OYSTER ENEMIES.

From statements of dealers and tongers, as well as from observation, it appears that the oyster in this locality has no aggressive enemies. Physical conditions, however, are often decidedly injurious to certain bars or localities. Storms may cause a shifting of sand or mud over the beds and stifle the mollusk, freshets may deposit a layer of mud, droughts may reduce greatly the food supply, and freezing weather accompanied by a low tide may prove very harmful.

The following information is furnished respecting certain enemies which are common in other parts of the Gulf coast:

*Drills or conchs.*—So few drills were found on the oyster beds that no damage whatever was noted, and they may be regarded as a negligible quantity in these waters. The few that were taken were found, for the most part, in the western extremity of Apalachicola Bay, in the vicinity of West Pass, where the salinity naturally attains a high degree for a part of the time at least. Under the description of the various beds, mention is made of the places and number of drills taken. It is commonly supposed by oystermen that the drill secretes an acid by which it perforates the oyster shells by solution, but in reality the holes are made mechanically by means of a rasplike tongue, which is protruded from the mouth.

*Mussels (Mytilus hamalus).*—This species, which was found on the oyster bars, is distinct from the large edible sea mussel of the Atlantic coast and, also, the fresh-water mussel used for the manufacture of buttons and novelties. So far as is known, it has no present economic use, but doubtless it would make a good fertilizer. Although this mollusk is classed as an oyster enemy, it is not one in the sense of preying on this more valuable shellfish. It is injurious in that it eats the same kind of food as the oyster, and, therefore, lessens the food supply; and its more prolific growth enables it to cover the oyster, which interferes with its development, and eventually, may stifle or starve it.

Mussels were found in varying quantities on practically all of the oyster beds. They were found in rather larger numbers on the reefs in the vicinity of East Bay, where the salinity of the water is reduced by reason of the proximity of the large affluents, and, also, on the beds in the southeastern section of St. Vincent Sound. They were only fairly abundant on the eastern beds, and least so at the western ends of both Apalachicola Bay and St. Vincent Sound.

*Drumfish (Pogonias cromis).*—The black drum was not observed during the survey, nor was it learned that it had ever caused destruction of the oysters of this region. It is enumerated here in the list of enemies, because it may appear suddenly on any part of the coast and is reported to have destroyed oysters on the beds of Alabama. It destroys oysters by crushing them between the stout grinding teeth or bones with which its mouth is furnished.

*Minor enemies and pests.*—Among the minor but objectionable enemies observed during the survey may be mentioned the following: Barnacles, although generally small, were plentiful on some beds. They roughen the shells and crowd the oyster, but do comparatively little harm. The little clam *Martesia* was found more particularly in the larger and older shells, which were weakened by the boring, but

the inner cavity was seldom penetrated. At a few stations a coral growth was observed on the oysters. Marine algæ were noted growing luxuriantly on the clusters at a number of stations, usually near the inner limits of the beds.

### SPAWNING.

The conditions of spawning probably do not differ from those generally obtaining on the Gulf coast, and it is therefore not necessary to discuss the subject at any length. It will suffice to repeat what has been said in a previous report.<sup>a</sup>

The spawning of oysters consists, in brief, of the discharge of eggs from the female and spermatozoa from the male which meet and fuse in the surrounding water. The fertilized eggs develop into minute embryos, each furnished with a little brush of cilia or hairlike processes which vibrate in rhythm and propel it feebly through the water. After a time, varying with the temperature of the water, the embryos develop a tiny shell, which by its weight eventually precipitates them to the bottom, where, if they fall upon a suitable, clean, firm, support, they attach and grow into spat, but if not they speedily die. As their own powers of locomotion are inconsiderable, the wide distribution of the young oysters in their swimming stage is dependent upon the currents.

Oysters in the spawning condition are of a peculiar creamy color, with branching lines traced over the surfaces of the body. When they are cut the ripe genital products at once exude from the wound, but if the shell be opened carefully and a gentle pressure exerted upon the body they will be discharged from a definite opening lying below the muscle (usually called by the oystermen the "eye" or "heart") which extends between the two valves. This is the pore from which they flow in the normal process. Ripe oysters in the language of the oystermen are aptly described as "milky."

Spawning takes place, in the main, during spring and summer, in any given region, extending over a period of some months, depending upon the latitude and the climate. On the Gulf coast I have found during almost every month oysters which were apparently ripe, and from which there were obtained eggs which readily separated in the water and had every appearance of maturity. Whether such eggs would be extruded during the winter under natural conditions is doubtful, and if they were it is practically certain that they would not develop, as the experience of all investigators has shown that development is inhibited if the temperature of the water drops materially below 70°.

The oysters were first observed in "milk" in Apalachicola Bay on March 15, but owing to a decided fall in temperature the development

<sup>a</sup> Moore, H.F.: Oyster bottoms in Matagorda Bay. Bureau of Fisheries document no. 610, 1905.



of this condition was greatly retarded or ceased entirely for a period of about three weeks. By the middle of April, however, just as the survey was nearing completion, the oysters were becoming milky throughout the district. The stock was generally strong and vigorous and had every indication of a satisfactory productivity.

On the various reefs there were noted from time to time a number of spat, but they appeared to be those that failed for some reason to mature or develop properly the preceding year. These are usually called "runt oysters."

A freshet during the early spawning season may, in consequence of a deposit of mud and silt, have a serious effect on the spat as well as on the maternal oyster.

### OYSTER CULTURE.

Although the State provides suitable regulations for leasing barren grounds for the purpose of oyster culture, the industry is carried on to a very limited extent by private enterprise. At the time of the survey there were but three claims, all situated in St. Vincent Sound, and having an area of 113.5 acres.

During the spring of 1914 the State planted several thousand barrels of oyster shells on the principal public bars from Green Point and Porter Bars in St. George Sound to Paradise Flat in St. Vincent Sound.

From the good average quality of the stock and the thickness and solidity of the shells, it appears that the waters furnish food and lime in quantities sufficient for the growth and development of the oysters, and also that a larger acreage could be maintained profitably without impairing or vitiating the public beds.

There have been pointed out under the discussion of barren bottoms different areas having good firm bottoms, apparently suitable for the establishment of safe and remunerative oyster beds. The western limit of St. Vincent Sound has a hard bottom generally and but few oysters. This latter condition may be due in part to the reduced width of the sound, its exposure to storms, and occasional strong currents, but probably to the high salinity of the water for periods longer than the oysters can endure with the best results. Before the planting of beds at places tentatively selected, it may be advisable to study the course of the currents, the action of storms on the bottoms, and the deposit of silt.

Bulkhead Bar, although it does not bear a very good grade of material, could be made to produce a much better quality of oysters, provided the beds were judiciously cultivated. As it now stands, it is too densely populated to yield stock that will command prices commensurate with the time and labor necessary to place it on the market.

## RÉSUMÉ, CONCLUSIONS, AND RECOMMENDATIONS.

Following is a summary of the results of the survey, with the conclusions and recommendations based on them:

1. The survey covered the western portion of St. George Sound and all of Apalachicola Bay and St. Vincent Sound; approximate area, 130 square miles.

2. The area of the oyster beds is 7,135 acres, or 11.1 square miles, of which about two-thirds support dense growth.

3. It is estimated that during the season 1914-15 the contents of the beds were 2,627,534 bushels over 3 inches long and 500,629 bushels of smaller ones, based on the standard bushel, which is less than one-half the volume of the Florida oyster tub, or so-called "bushel."

4. Bulkhead and East Hole Bars taken together contain less than one-fifth of the total oyster area but nearly one-half of the oyster content. On Bulkhead Bar many of the denser stations revealed a crowded condition of closely clustered raccoon oysters.

5. The yield for the entire district for 1914-15 was about 40 per cent less than for the preceding season, due to the demand, for the supply was sufficient to meet a much larger requirement.

6. The oysters of these waters have no aggressive enemies, and no diseases were observed. Physical phenomena, however, have greatly damaged many of the bars.

7. St. Vincent Bar, which was showing sign of depletion, was closed during the latter half of the 1914-15 season by order of the State shellfish commissioner. Porter Bar, which has suffered depletion by storms, should be carefully guarded by the State authorities that it is not overfished; this also applies to the important bars in St. Vincent Sound.

8. About 91 per cent of the total area of the district is composed of barren bottoms, the greater part of which is unsuited for oyster beds. Several favorable regions for oyster culture have already been pointed out. It appears that the natural development of patches and new beds, such as the Fish Hawk Bar, as well as the recovery of old beds after having been depleted by storms, freshets, or freezes, show good conditions and possibilities for oyster culture.

9. The permanent triangulation points established by the United States Coast and Geodetic Survey, together with the few established by this Bureau, will be of great value and should be used in determining the exact location of future leased bottoms for oyster culture. A strict compliance with this recommendation will guarantee accuracy in the surveys, obviate disputes, and secure an honest and correct assessment of rentals.

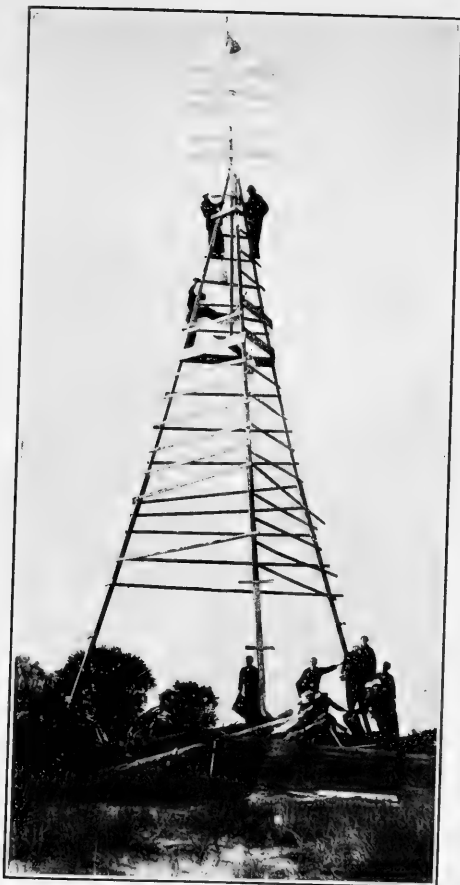


FIG. 1.—SIGNAL AT ST. VINCENT POINT.

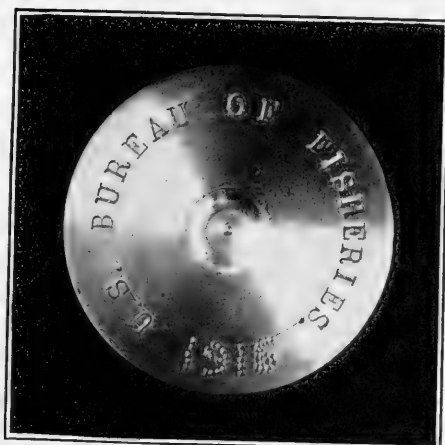


FIG. 2.—BRASS DISK IN TOP OF CEMENT MONUMENTS.



FIG 3.—OYSTER FROM PORTER BAR  
(Natural size.)



FIG. 4.—CLUSTER FROM CAT POINT BAR.  
(slightly reduced.)



FIG. 5.—CLUSTER FROM BULKHEAD AND EAST HOLE BARS.  
(Five-sixth natural size.)



FIG. 6.—CLUSTER FROM ST. VINCENT BAR.

(Reduced  $\frac{1}{2}$ .)

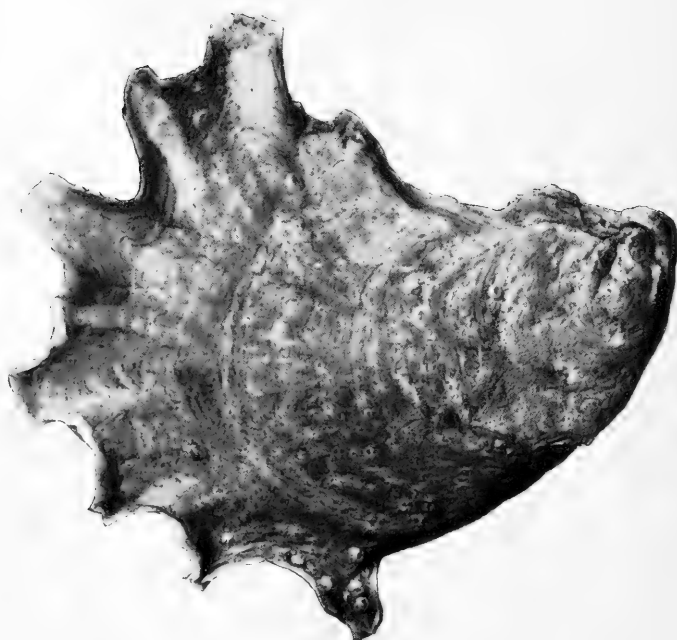


FIG. 7.—OYSTERS FROM FISH HAWK BAR.  
(Slightly enlarged.)





FIG. 8.—OYSTER FROM BIG BAYOU BAR.  
(Natural size.)



THE HISTORY  
OF  
THE APALACHICOLA  
RIVER  
IN  
FLORIDA

By  
J. M. HARRIS  
OF THE  
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# FISHING IN THE PRIAMUR DISTRICT OF SIBERIA

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By JOHN K. CALDWELL

*American Consul at Vladivostok, Siberia*

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Appendix VI to the Report of the U. S. Commissioner of Fisheries for 1916

6111°—17—44

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## FISHING IN THE PRIAMUR DISTRICT OF SIBERIA.<sup>a</sup>

By JOHN K. CALDWELL, *American Consul at Vladivostok, Siberia.*

### INTRODUCTION.

Fishing is probably the most important industry in the Russian Far East. It is the only industry in the district which not only attempts to supply the local market but exports to the European Russian and foreign markets.

The fishing industry is entirely under the control of the Russian Government and is a State property, with the exception of a few fishing stations belonging to the city of Nikolaievsk on the Amur, which are run by the municipality of that city, and also a few places on the seacoast and in the rivers, donated to local tribes of aborigines.

In the Maritime, Kamchatka, and Amur Provinces fishing is controlled by the Khabarovsk office of the Department of Domains. Administratively the waters are divided into two classes: (1) Waters allotted exclusively to Russian subjects, and (2) waters open to Japanese fishermen by virtue of the Russo-Japanese Fishing Convention of 1907. The first class comprises rivers and their estuaries, lakes, gulfs, bays, and harbors; the waters opened to foreign fishing comprise chiefly open seacoasts. Up to the present no foreigners other than Japanese have made any attempt to obtain such fishing rights.

Very little is known as yet as to the value of the fishing places, for practically no study has been made of the Priamur waters. The works of Braginoff and Soldatoff, ichthyologists attached to the Khabarovsk office of the Department of Domains, merely pave the way for a more extensive study. Some practical knowledge of the value of certain fishing places exists, undoubtedly, among private fishermen, principally Japanese, but it is not general knowledge. Therefore the Department of Domains has no way of exploiting various fishing stations other than by allotting them to the highest bidder at public sale, and even then being very careful to allot them first for a very short period—from one to three years. After a strict watch

<sup>a</sup> The investigation on which this report is based was requested by the Bureau of Fisheries. It is now published because of the value of the information to American fishing interests, particularly those of the Pacific coast.

of the amount of the catch, some idea of the value of the station is formed and it is allotted for a longer period—five years or more.

Naturally under such circumstances this industry can not attain proper development. The fishermen are not better informed than the Government as to the value of the stations sought at the public tenders; often they over or under value them, and owing to their limited knowledge, either overstock the stations with men, salt, barrels, provisions, etc., and through a small catch suffer heavy losses or insufficiently supply the stations and, therefore, are unable to take advantage of a good run of fish. On the other hand, the short terms of the contracts make it impossible to equip the stations properly. Lack of equipment for preparing the fish, except in the crudest way, has resulted until very recent times in inferior products at most of the stations, but some of the Russian fishing stations in Kamchatka are exceptions. In order to encourage the Russian fishing in Kamchatka and Tchukotski peninsular waters and in the Okhotsk Sea, and to counterbalance the Japanese predominance in these waters, in 1913 the head administration of the Agricultural and Land Organization gave to Denbigh & Biritch on a long lease a fishing station on the Kamchatka River (eastern shore of Kamchatka), and to S. Grushetsky & Co., one on the Bolshaya River (western shore of Kamchatka). In addition to the usual conditions of the lease (payment of royalty, the prohibition of foreign labor, etc.), each of these firms was to build a fish hatchery in the vicinity of its station, the capacity of which was to be 3,000,000 salmon per annum. Each of the above lessees was to release 500,000 fish in 1914, 1,000,000 in 1915, and 3,000,000 yearly from 1916 until the expiration of its lease. Owing to technical difficulties, the release of the first lot of fish was postponed until 1915.

By a normal development of this condition, which may become a law, each commercial fisherman will be compelled to release a much larger number of young fish than his catch. The larger interests will have their own hatcheries, where doubtless the smaller ones can buy their quota.

#### TRANSPORTATION DIFFICULTIES.

The closing of the coasting trade to foreigners deprived the fishermen of the possibility of making use of the cheap freight rates of foreign steamers, and has made them entirely dependent upon the Volunteer Fleet, which has a monopoly as a public carrier.

The Volunteer Fleet is complying strictly with all the obligations imposed by the terms of its contract with the Government. It is making the stipulated number of voyages with the stipulated number of vessels, but as a matter of fact the number of steamers is not

sufficient for the trade. According to section 3 of the contract, the Volunteer Fleet is obliged to put on the line not less than four steamers having a carrying capacity of not less than 1,000 tons each and adapted for northern navigation. Each steamer must have accommodations for not less than 20 cabin and 100 deck passengers, and regardless of the fact that the number of steamers has doubled, it is not sufficient for the entire satisfaction of the fishermen's needs, thereby causing heavy losses.

On account of the limited number of vessels, the Volunteer Fleet is forced to make long round trips to distant points with calls at many side ports. When leaving Vladivostok the vessels take on sufficient coal and water for the round trip. This occupies two-thirds of the carrying capacity and leaves very little space for cargo. These long trips force the greater number of the fishermen to ship men and provisions one and one-half months before they are required, and to hold their product a month after the catch is over. Owing to the long time that goods are on the way, the fishermen are obliged to salt their products very heavily, which tends to lower their price on the Russian market. Consequently, the fishermen are obliged to depend on the Japanese market. The high charges of the Volunteer Fleet for loading and discharging, and charges for c. o. d. delivery (2 per cent), add 14 to 15 cents per pood of 36.1128 pounds to the cost of fish products from Kamchatka. It is claimed that so long as the Volunteer Fleet continues to be the only steamship company serving the fishing industry, there is not much hope of a healthy and normal development of the fisheries. Also, the element of risk to the average fisherman is so great and so hard to calculate, that the fishing industry, which in Japan represents a safe commercial undertaking, in Russia becomes a game of chance.

Under present conditions the fishermen are subjected to the following risks: (1) Late arrival at the stations with men and provisions; (2) inability to ship prepared products; (3) enforced pay of workmen for overtime spent at the stations; (4) impossibility of obtaining additional salt and barrels if the catch is excessive, and of replacing men in case of strikes, for most of the stations are visited by steamers only twice each season.

From the time the fisherman arrives at the station, until his departure, he is without communication with the outside world. Although a telegraph line was built over a year ago along the shores of Kamchatka, it is not in operation owing to the lack of operators and other difficulties.

### COMPARATIVE COST OF OUTFITTING RUSSIAN AND JAPANESE FISHING STATIONS.

In order to emphasize the unfavorable conditions under which the Russian fishermen have to compete with the Japanese, the Chamber of Commerce committee gives comparative tables showing the cost of equipping an average Russian fishing station, catching about 60,000 fish and employing 30 men, and a Japanese sea-coast station of similar size.

#### RUSSIAN STATIONS IN KAMCHATKA.

30 men for 5 months, at \$20 per month.....	\$3,000.00
Return passage for them at \$8.75 per man.....	262.50
Freight on 35 tons of provisions and equipment.....	200.00
Freight on 1,800 sacks salt (90 tons).....	405.00
Freight on 155 tons prepared fish.....	1,284.50
Royalty on 155 tons.....	229.50
Land rental.....	37.00
Commission expenses.....	313.00
1,800 sacks of salt at 65 cents.....	1,170.00
Nets.....	350.00
Boats.....	50.00
Dories (native type).....	300.00
Incidentals.....	100.00
Total.....	7,701.50

It must be mentioned that there are very few experienced workmen, salters and caviar makers. Those who have had experience during past years have settled along the coast and have their own undertakings; therefore the fishermen are obliged to hire unreliable men. There are no fishery schools in the country, and the lack of instructors and good foremen is felt more and more each year.

The absence of credit institutions, which would make loans on fish, and the high rate of interest charged by private banks are also felt very much.

The Russians have no fishing fleet, but the Japanese possess a large deep-water fleet. According to the figures for 1910, there were 7,302 Japanese fishing sailboats, 49 fishing steamers, and 396 large fishing boats of European type, in addition to a large number of commercial vessels, which gave the Japanese a choice of vessels for the transportation of their products. Moreover, competition has kept freight rates low. Several small fishermen could charter a steamer on joint account, and in order to evade the rule prohibiting foreign steamers from navigating between stations, several stations could be rented in the name of one man and later subleased to the real owners.

In 1913 a Japanese steamer of 1,500 tons, having a speed of 9 knots, consuming from 15 to 20 tons of coal a day, could be chartered for about \$100 a day. The chartering of such a steamer for 30 days, taking 20 days for the return trip (Hakodate-Kamchatka) and 10 lay days, would have cost:

Voyage, 30 days, at \$100.....	\$3,000
Coal, 20 days' steaming, 400 tons, at \$3 per ton.....	1,200
Coal, 10 lay days, 100 tons, at \$3 per ton.....	300
Other expenses, maximum figures.....	250
<b>Total.....</b>	<b>4,750</b>

Such a steamer would carry about 1,500 tons of cargo per voyage, and therefore the freight would be only about \$3.17 per ton.

If the steamer was chartered on the basis that it pays all expenses, the cost in 1911 would have been:

	Charter cost per day.
500 tons.....	\$88 to \$100
2,000 tons.....	138 to 150
2,330 tons.....	160

This would have been the cost when chartered by the day, but a monthly charter would have been at least 10 per cent less; a charter for the whole season, especially if made early—say, in March—might have been had at as much as a 30 per cent reduction.

In this way the cost of transporting fish from Kamchatka to Japan was one-third less than to Vladivostok. The cost of transporting workmen from Hakodate to Kamchatka was about \$1.50 per man, one-fourth of what it cost for Russian workmen from Vladivostok. The same difference will be observed in regard to the cost of workmen. A Japanese workman costs a little over \$50 per season, viz: Wages, \$25; food, etc., \$19.50; and commission on catch, \$8.50. Also, there is never a shortage of men in Japan.

The cost of a Japanese fishing station would be:

Wages for season, 30 men, at \$25 per season.....	\$750.00
Commission on catch.....	250.00
Chartering schooner 5 months, at \$250 per month.....	1,250.00
Food for 30 men, at \$19.50 each per season.....	585.00
Passports, \$1.75 each for 30 men.....	52.50
Rent of fishing station.....	500.00
Nets and dories (same as Russian).....	800.00
1,300 sacks of salt, at 65 cents per sack.....	1,170.00
<b>Total.....</b>	<b>5,357.50</b>

Herewith is given a comparison of the working conditions of Russian and Japanese fishermen in Kamchatka:

#### RUSSIAN FISHERY.

1. The Russian fishing fleet is represented by 4 motor schooners and 3 steamers.
2. No Russian steamers are open for charter, and in the present state of the local industry even a subsidized purchase of steamers is not profitable.
3. Russian fishermen are bound by the schedule of the Volunteer Fleet, are unable to increase their stock of provisions, etc., at will, and at times run the risk of not arriving in time or not being able to ship the prepared product.
4. Delivery of fish cargoes, including discharging expenses, costs \$8.40 to \$10.50 a ton.
5. Transporting workmen from Vladivostok and return costs \$8.65 each.
6. Wages per season for workmen (5 months) amount to about \$100 per man.
7. Equipping and running a station to catch 60,000 fish costs about \$7,701.50.
8. Delivery of product to Vladivostok costs about \$8.40 per ton.

#### JAPANESE FISHERY.

1. The Japanese fishing fleet has 7,302 sailing vessels, Japanese type, 396 foreign type, and 49 steamers.
2. There are a great number of vessels in Japan, and the strong competition makes it easy to charter them on time or for the season.
3. Having a schooner or steamer at his disposal, the Japanese fisherman is always able to communicate with Hakodate, and runs no risk of not having his goods transported.
4. The delivery of all cargo costs the Japanese not over \$3 a ton.
5. Transporting Japanese workmen costs \$3 each.
6. Wages per season for workmen are about \$33.50 per man.
7. Outfitting and running a station to catch 60,000 fish costs about \$5,357.50.
8. Delivery of product to Hakodate does not cost more than \$3 per ton.

#### REGULATIONS GOVERNING FISHERIES.

The method of leasing fishing stations for exploitation, as well as the regulations for exploiting, vary according to the local conditions.

On the Amur River, within the limits of the Nikolaievsk, Mariinsk, and Khabarovsk districts, fishing stations are leased at public tender, written or oral. The placing of outfits for catching sturgeon only is permitted, except during the closed period, from the time the ice on the river breaks up to June 15-28, upon payment of a special ticket tax. For this purpose the supervisors of the districts make up a list of applicants for each district, and present it for ratification to the Priamur Department of Domains, after which public tenders are held in each district at the place of residence of the supervisor. Some of the stations are leased for long terms and some for one year.

No foreign workmen are allowed at the stations located on the Amur River. In the estuary of the Amur River foreign subjects are allowed to prepare the fish only, but not to catch them; the latter is to be done exclusively by Russian subjects. Fishing is carried on only by means of "zaezdka," a special kind of hedge made of poles with a trap arrangement at the end, or by means of throw nets.



Arrangements with hooks are permitted for catching sturgeon. The length of the net and hedge is established for each station and depends upon the width of the river. All other conditions are of a secondary nature

The right to fish along the seacoast of the whole Russian Far East is open to Japanese subjects on an equal basis with Russians, by virtue of the Russo-Japanese Convention of 1907, which was concluded for a term of 12 years; the stations applied for, after being ratified by the Priamur Department of Domains, are sold at public tender, usually during February and March. The convention excludes certain bays and gulfs, in which fishing rights are granted only to Russian subjects. There is no restriction as to the nationality of the laborers employed at the sea fishing stations or as to the method of preparing the fish products, except that the manufacture of fertilizer from salmon is not permitted. The use of vessels under foreign flags is allowed. Throw nets can be used, but they are being replaced by permanent nets, the usual type of which are called "tateami."

In the bays and gulfs excluded by the Russo-Japanese Fishing Convention (Peter the Great Bay, Imperial Harbor, Vanina Bay, Avatchina Bay and several others), as well as in the rivers in the Okhotsk-Kamchatka district, the Priamur Department of Domains may, in accordance with an order of the Agricultural Department, grant fishing rights without public tender to trustworthy persons, first for one season, after which, if the business has been established on a firm basis, for a term of 12 years, under the control of the Minister of Agriculture and Land Organization (law of June 21, 1910, pertaining to river fishing stations).

A rental charge of 5 kopecks ( $2\frac{1}{2}$  cents) per pood of 36.1128 pounds of prepared product is made, and an unalterable condition in such leases is that the lessee is obliged to use exclusively Russian laborers and sailing vessels under the Russian flag. The use of foreign steam vessels is not prohibited by the administration. Throw nets not longer than the width of the river at the place of catching are allowed as are also set nets, the "zaezdka" of the Amur type, which consist of a barrier placed across the river from the shore to deep water and end in a trap. In Peter the Great Bay, in addition to the above, set nets and large drag nets are permitted.

The length of the "zaezdka" can not be more than half of the channel width; in reality a large part of the channel of the river where "zaezdka" are used is kept free to permit the passage of fish up the river. All other minor conditions of the lease are covered in the contract.

The catching of sea kale, crabs, shrimps, and trepang is now almost exclusively carried on in Peter the Great Bay and the neighboring coast; it is concentrated in the hands of small fishermen who obtain special tickets for this purpose from the supervisor of the southwestern district.

#### THE FISHING INDUSTRY IN 1913.

Along the extensive coast line of the Priamur district many varieties of commercially valuable fish are found. The northern waters of Tchukotski and Kamchatka produce mostly salmon varieties, the principal of which are gorbusha, known in Alaska as humpback or pink salmon; keta, the Alaskan chum, or dog salmon; kisutch, the Alaskan coho, or silver salmon; tchavitchcha, the Alaskan king, or chinook salmon; krasnaya, the Alaskan sockeye, blueback, or red salmon, and golets, known in Alaska as Dolly Varden trout.

Dolly Varden trout are occasionally caught, when they happen to run with the salmon.

Undoubtedly there are other kinds of fish in these waters, for in years past American whalers visited the cod banks of Kamchatka, but at present there is no cod fishing. Practically no attention is paid to any but the salmon, the principal reason for this being the almost total absence of local population and supplies, compelling the fishermen to obtain laborers and all supplies from distant places. As soon as the run of the principal fish is over the station is closed, the men sent away, and no one is left to watch later runs or to study the possibilities. Also the early winters would prevent late shipping of fish if any were caught, and the catch would have to be held until the arrival of the first steamer in the spring.

The waters of the Priamur district are subdivided into several sections. Following is given a short description of the characteristics of each.

#### NIKOLAIEVSK DISTRICT.

This district comprises the whole lower part of the Amur River from the village Zimmermanovka down to the mouth of the river, about 300 miles; the River Amgun, 200 miles; the Amur estuary, about 150 miles on the mainland and about 130 miles on the coast of Sakhalin Island and about 865 miles of the coast line on the southwestern shore of the Okhotsk Sea.

In addition to the regular fish-catching stations there are the salting stations, which do not catch but only buy and handle fish, caviar, etc., from other fishermen, mostly local peasants, natives, and industrial fishermen. These salting stations, as will be seen from the following table, are quite numerous.

According to official figures for 1913 the number of fishing stations of all kinds in this region was as follows:

Kind of station.	Number of stations.	Term of lease.	Annual rental.
<b>Government stations:</b>			
Catching.....	23	Long term.....	\$109,012.00
Salting.....	7	One year.....	10,677.00
	47	Long term.....	19,742.10
	34	One year.....	20,967.00
Total.....	111		160,398.10
<b>Municipal stations:</b>			
Catching.....	14	Long term.....	56,282.10
Salting.....	13	One year.....	28,692.00
	1	Long term.....	
		One year.....	125.00
Total.....	28		85,099.10
Grand total.....	139		245,497.20

In addition to the above stations 53 Russian villages and over 122 native settlements participated in the fishing industry.

In 1913 the run of humpback salmon, which began in the estuary on June 16 and in the river June 18 or 19, lasted during the whole season; this species was also found in the autumn chum run. The run was above the average and almost equal to the run of 1912. At the Government stations below Nikolaievsk 2,845,687 fish were caught, at the municipal stations 2,731,546, and at the Government stations above Nikolaievsk 111,000, while only 1,780,561 fish were caught by the local population. The summer and autumn runs of chum salmon were very irregular, especially the autumn run, which was divided into four separate runs, the last of which was so unexpected that many fishermen had already closed their stations for the season before it appeared.

The Nikolaievsk district was formerly the chief source of supply of fish to Japan, and the great majority of Nikolaievsk fishermen were largely dependent upon Japan, not only for a market but also for working capital. The Japanese, however, finally offered such low prices for the fish and made the credit conditions so unfavorable that the fishermen were compelled to look for another outlet for their product. Such an outlet was found in European Russia, and the secret of success of this new departure of the business was salmon caviar.

Only a few years ago salmon caviar was almost an inedible product; it was carelessly prepared, crumpled, and poorly packed. About six or seven years ago the Volga River black caviar dealers became interested in the Amur salmon caviar and began to experiment with it. They introduced cleaner and more careful methods of washing and a better method of packing it, with satisfactory results. The caviar was thoroughly tested, stood transportation, and gradually

came to be one of the most valuable by-products of the fishing industry, commanding a much higher price than the fish itself.

The newcomers also changed the method of salting fish, and instead of producing crude briny fish prepared with inferior salt from Japan they carefully selected the fish and thoroughly washed and mildly salted them with the best salt. The resulting product, called "semga," is similar to European cured salmon. The best qualities stand the railway transportation to European Russia, where they command a very high price.

The Government met the fishermen halfway by lowering the freight rates and by extending more liberal credits through the Government bank, as is shown in the following extract from an order of the Government bank regarding loans to fishermen, against promissory notes with one signature for working capital:

With a view to extending credit to the fishermen of the far east the Government bank has found it possible to allow the issuance of loans to the fishermen for working capital against the following guaranties:

1. Fishing equipment; mortgages on fishing property and buildings.

2. Real estate, situated outside the fishing station, or a sold warranty.

All applications of fishermen are to be submitted, in accordance with clauses 30 and 65 of the bank's by-laws, for approval of the discount and loan committee of the branch, and forwarded to the council of the bank for ratification.

Further, in view of the fact that the property which is to serve as a guaranty for the loan is situated on land rented from the Government, and taking into consideration the special conditions of the rental of these lands, the bank has found it necessary to establish, in agreement with the Department of Land Organization and Agriculture, the following regulations:

1. Credits will be opened only after an investigation of the financial standing of the fisherman, made with the assistance of a local representative of the Priamur branch of the Department of Domains.

2. Credits will be in accordance with the verified appraisement of the fishing property made by the Priamur branch of the Department of Domains.

3. When opening a credit against goods, a special notarial application to the Department of Domains is to be made by the borrower, stating that he gives the Department of Domains the right to cancel his rent contract at the first demand of the Government bank, and to use money deposited and sums due to him for the property, for the purpose of paying his debts to the bank.

4. The application mentioned in paragraph 3 is to contain a clause by which the borrower agrees not to remove any buildings at the fishing stations, nor to turn them over to another person without having obtained the required permit from the bank.

5. The application mentioned in paragraph 3 is to be turned over by the bank to the Priamur branch of the Department of Domains with the request that the bank be assured that the conditions of the application will be carried out by the Department of Domains.

The Japanese, realizing their mistake, have put up a strong fight for the Nikolaievsk district. As late as 1913 the Japanese firm P. N. Shimada, at Nikolaievsk, offered the Nikolaievsk fishermen the following prices for fish prepared in Japanese style: Summer hump-

back salmon \$1.25, summer chum salmon \$3.50, and autumn chum salmon \$7 per 100 fish, the salt to be supplied free by Shimada. This proposal did not meet with much success.

The following tables show by species the catch of salmon in the Nikolaievsk district and the quantity prepared for the Russian market, 1909 to 1913:

Years.	Catch.			Prepared for Russian market.			
	Hump-back.	Chum.		Hump-back.	Chum.		Caviar.
		Summer run.	Autumn run.		Summer run.	Autumn run.	
	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Tons.</i>
1909 .....	2,209,433	9,574,285	4,858,099	145,373	877,423	1,398,416	1,040
1910 .....	5,076,286	12,536,174	5,814,498	1,005,274	2,497,165	1,975,033	1,397
1911 .....	2,621,449	10,749,482	4,686,236	523,338	2,197,168	2,424,890	1,123
1912 .....	5,822,729	7,199,309	3,669,073	1,154,913	4,009,574	2,886,869	1,171
1913 .....	5,688,233	7,985,579	4,324,187	4,806,629	6,608,804	3,212,499	1,107

The number of salmon—fresh, salted, and frozen—delivered to Japanese buyers, 1909 to 1914, was, by species, as follows:

Years.	Fresh and salted.			Frozen.	
	Humpback.	Chum, summer run.	Chum, autumn run.	Hump-back and chum, summer run.	Chum, autumn run.
1909 .....	2,029,200	8,733,623	3,510,847	48,463	157,081
1910 .....	4,071,012	10,039,101	3,195,506	15,000	343,959
1911 .....	2,081,625	8,025,216	2,368,798	105,328	129,801
1912 .....	4,686,016	3,295,603	780,303	102,000	120,000
1913 .....	881,604	1,231,775	953,688	118,000	158,000

In 1913 in the Nikolaievsk district salmon were prepared for the Russian and other than Japanese markets, as follows:

	Hump-back.	Chum, summer run.	Chum, autumn run.
Salted .....	<i>Tons.</i> 5,920	<i>Tons.</i> 16,794	<i>Tons.</i> 14,918
Smoked .....	284	5	8
Canned .....	15	41	527

These figures show the small quantity of fish that is canned in this district. Some experts claim that the Amur salmon is not suitable for canning purposes. In the whole district there is only

one canning factory, that of W. J. Miller, the 1913 output of which is shown in the following table:

	Quantity.		Value per case.
	Cases.	Cans.	
Humpback and chum salmon:			
Natural, round cans.....	600	28,800	\$3.90
In jelly, round cans.....	58	3,480	6.00
In tomatoes, oval cans.....	64	3,200	9.00
Pickled, oval cans.....	132	6,600	9.00
In tomatoes, round cans.....	486	24,300	7.00
Pickled, round cans.....	41	2,050	7.00
In tomatoes, round $\frac{1}{2}$ cans.....	237	23,700	10.00
Pickled, round $\frac{1}{2}$ cans.....	70	7,000	10.00
Total.....	1,688	99,130	
Caviar.....	53	4,420	20.40
Sturgeon:			
In tomatoes and pickled, square $\frac{1}{2}$ cans.....	60	6,000	18.00
In tomatoes and pickled, square $\frac{1}{2}$ cans.....	15	750	16.00
Total.....	75	6,750	

In 1913, by the steamer *Broadmore*, the following frozen fish were shipped: Chum salmon (summer run), 118,000, at \$6.25 per 100 fish, and chum salmon (autumn run), 108,000, at \$12.50 per hundred. Also, 50,000 fish were taken up the river in a refrigerating barge.

#### SAKHALIN DISTRICT.

This district includes the entire coast line of Sakhalin Island with the exception of that facing the Amur estuary, which belongs to the Nikolaievsk district. It is the smallest district and is now of no great importance. Before the Russo-Japanese War it was the most important district so far as herring fishing was concerned. The richest local fishermen, Semenoff, Denbigh, Biritch, and others, made their fortunes here.

The 1913 catch was not good, due to storms and a poor run of herring, the principal fish of the district. The catch was as follows:

Years.	Chum salmon.	Humpback salmon.	Herring.
1911.....	31,000	286,000	12,640,000
1912.....	16,000	126,000	14,036,000
1913.....	38,000	183,000	4,483,000

The product prepared amounted to 1,212 tons in 1911, 1,068 tons in 1912, and only 690 tons in 1913.

In 1913 there were 14 stations on the island, of which 2 fish-catching and 2 fish-salting stations were in nonconventional waters, and 10 in conventional waters, 5 of the latter belonging to Russian and 5 to Japanese fishermen.

The catch in 1913 was made into the following products:

	Tons.
Fish, salted Russian method.....	79
Caviar, Russian method.....	22
Fish, dry-salted for Japanese market.....	274
Herring fertilizer.....	274
Fish oil.....	38
Caviar for Japanese market.....	3
Total.....	690

#### OKHOTSK-KAMCHATKA DISTRICT.

The northern waters of the Priamur, including the above-named district, are still dominated by Japanese fishermen. The Russo-Japanese Fishing Convention of 1907 opened the doors of this district to them, and in these waters they are far better equipped than the Russian fishermen. A fair knowledge of the fishing grounds was already at the disposal of Japanese fishermen, because Japanese schooners were in the habit of visiting and fishing in these waters long before such rights were explicitly granted to them. They also had at their command a large force of good, experienced, and cheap labor, a large sailing fleet, cheap credits, and ready markets at home.

The Russians, on the contrary, were very much handicapped; the waters were entirely unknown to them; they had no workmen, no fleet, no credit, no capital, and no market but the Japanese. Naturally, under such circumstances, the Russians had to begin in a very moderate way and principally at places outside the conventional area, in rivers and closed bays which were visited by the Volunteer Fleet steamers. Further development of Russian fishing in these waters could progress but slowly. Some progress was made, but the full "Russification" of the industry in these waters is a question for the remote future.

Since 1907 the progress of Japanese fishing can be seen in the increased number of fishing stations, the larger number of workmen at the stations, and the replacement of the sailing fleet by steamers. The present general appearance of the Japanese fishing station is just the same as in the past—temporary bamboo structures covered with matting, and the method of salting is the dry-salting process under the open sky, without washing the fish. Only at places where there is a good run of red, or sockeye, salmon is there an increase of canned products, which are prepared merely with salt and without spices, and a correspondingly better equipment of the outfits.

The bulk of the products prepared by the Japanese is sold in Japan and China. Of the canned salmon some is consumed in Japan and some is exported to England; no goods are prepared for the Russian market.

Russian fishing in the Okhotsk-Kamchatka district is, as previously stated, concentrated in the nonconventional waters, bays, and harbors, which are rented exclusively to Russian subjects on condition that they employ only Russian workmen and ships.

Since 1907 quite a change is noticeable in the position of Russian fisheries in these waters. During the first years the Russians prepared fish almost exclusively by the Japanese method of dry salting, only caviar being prepared for the Russian market. The number of salting stations, where Russian caviar makers buy raw caviar from Japanese fishermen and prepare it for the Russian markets, is still growing. Three well-equipped Russian fish-canning factories have been built, two on the river and one on the coast.

This region covers the coast line of the northern part of the Okhotsk Sea from Port Ayan to Penjin Promontory, about 1,620 miles. Regardless of occasional good catches, the Okhotsk shores are considered poor in fishery resources, and the natives are often unable to catch enough fish to provide for themselves and their dogs during the winter. In order to establish a reserve area and to guarantee the future stock of fish in this region, clause 11 of the fishing law of June 11, 1911, has been put in force since 1913, and the following waters have been closed for fishing: Uliya and Urak Rivers,  $2\frac{3}{4}$  miles along the shore each way from the mouth of the rivers; Okhota and Kukhtui, being two outlets of the same river,  $3\frac{1}{2}$  miles to the west from Okhota River and  $3\frac{1}{2}$  miles to the east from Kukhtui River, as well as the territory between, about  $2\frac{1}{2}$  miles; Kola, Tau, Yana, Arman, Ola, Yama, Takhyama, Nayakhan, and Gizhiga Rivers,  $2\frac{3}{4}$  miles on both sides of the mouth of each river.

The run of chum salmon in 1913 was of average proportions. It began July 14 and was heaviest between August 2 and 27; single fish were caught as late as early September. The run of humpback salmon was good. The catch was effected along the coast at seven fishing stations, six Japanese and one Russian. The number of salmon caught in 1913, compared with the two preceding years, was as follows:

	Chum.	Hump- back.	Sockeye.
1911 (4 stations).....	641,000	.....	38,000
1912 (4 stations).....	730,000	16,000	9,000
1913 (7 stations).....	679,948	204,014	.....

The product prepared amounted to 1,729 tons in 1911, 1,891 tons in 1912, and 2,005 tons in 1913. Of the 1913 product 1,928 tons were dry salted for the Japanese market, and 71 tons of Russian caviar and 6 tons of Japanese caviar were prepared.



At the river stations, outside of conventional waters, nine fishing stations and six salting stations were in operation in 1913, the catch amounting to 555,102 chum salmon, 41,252 humpback salmon, 3,198 coho salmon, and 17,035 Dolly Varden trout, from which there were prepared 534 tons of fish and 136 tons of caviar for the Russian market and 772 tons of fish for the Japanese market, a total product of 1,442 tons.

The catch in the entire district in 1913 consisted of 1,235,050 chum salmon, 245,266 humpback salmon, 3,198 coho salmon, and 17,035 Dolly Varden trout, and the product prepared amounted to 534 tons of fish and 207 tons of caviar for the Russian market and 2,700 tons of fish and 6 tons of caviar for the Japanese market.

The output for the entire Okhotsk district for the years 1911 to 1913 was 2,426 tons in 1911, 322 tons in 1912, and 3,447 tons in 1913.

*West Kamchatka district.*—This district includes the coast line from the Sopotchnaya River down to the southern Osernof shore fishing stations, a distance of about 335 miles. Kamchatka is very interesting between the middle of July and the last of August, the season for the red and pink salmon. On the west coast the Osernaya River is the only stream that the red salmon inhabit in any quantities. All fishing is done with a device called "kaku-ami," which consists of a main net and a fence net. The main net is 70 fathoms long and the fence net is 120 fathoms long. The fence net extends outward so as to guide the fish toward the main net. This device is set near the seashore in 10 fathoms of water, where the salmon run. When the fish are caught, the main net is hauled up by a boat and the fish are transferred to a bag net called "waku-ami," used for landing the fish.

In 1913 there were 152 fishing stations in this district of which only 9 were leased by Russians and 143 by Japanese. In 1912 there were 133 of such stations. At the public tenders for 1913 the Russians obtained 19 stations but transferred 10 of them to Japanese, after having made an arrangement with them in regard to the caviar.

One hundred and forty-eight stations were operated while 4 were idle. A certain growth of interest is noticed in the fishing in these waters, especially in the northern part of the district, but principally by Japanese fishermen. The stations are gradually moving toward the north, and the present empty coast lying between the Rivers Palana and Sopotchnaya will soon be occupied by fishermen. The increase in the number of stations will be seen from the following figures: 1910, 102 stations; 1911, 139 stations; 1912, 133 stations, and 1913, 148 stations. These figures do not include 15 river stations belonging to Russians, of which only 13 were operated in 1913.

The rental has also increased with the increase in the number of stations. In 1912 the highest price paid for one station was \$2,540,

and the average price per station was \$1,094. In 1913 the highest price was \$3,333 and the average \$1,390. In 1912 the total sum collected by the Government from the stations was \$113,348 and in 1913, \$175,674.

In this district there are also the following rivers where fishing is prohibited: Tigil River, 2½ miles to the north and south of its mouth; Oblukovina, 3 miles on both sides of its mouth; Kolpokara, 4½ miles to the north and 3 miles to the south of its mouth; Vorovskaya, 3 miles on both sides of its mouth; Kol, 3 miles on both sides of its mouth; Kikchik, 3 miles to the north and 1½ miles south; Bolshaya, 5½ miles north and 2½ miles south; Goliguina and Opala, 3 miles north of Opala and 3 miles south of Goliguina and the territory between them; and Osernaya, 3 miles to the north and 1½ miles to the south.

Formerly only sailing vessels served the stations in this district; later steamers made their appearance, and now a combination of steamers and sailing craft is growing in general use, the latter working as auxiliaries, feeding the steamers. The improvement in transportation is indicated in the following table of percentages:

	1910	1911	1912	1913
Japanese schooners.....	80	67.6	54.9	42.6
Japanese steamers.....	15	20.9	20.3	18.2
Auxiliary schooners.....	5	11.5	24.8	39.2

The 1913 catch was not good; heavy storms kept the schools of fish from approaching the shore, and often prevented any fishing. The total catch was as follows:

	King salmon.	Chum salmon.	Hump-back salmon.	Sockeye salmon.	Coho salmon.	Dolly Varden trout.
Coast stations:	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>
Russian (8).....	95	191,873	1,340,685	25,447	1,198	.....
Japanese (140).....	5,216	3,902,646	24,160,762	1,269,176	67,076	.....
River stations: Russian (13).....	4,196	373,812	1,842,090	226,653	33,195	99,690
Total.....	9,507	4,468,331	27,343,537	1,521,276	101,469	99,690

The output at the coast stations in 1913 amounted to 37,604 tons of fish, of which 1,030 tons, chiefly sockeyes, were canned, and the balance was Japanese dry-salted. There were prepared 1,134 tons of caviar, 102 tons according to the Japanese method, and the balance by Russian method.

A comparison of this catch with previous years is given below:

	1909	1910	1911	1912	1913
Number of stations.....	109	102	139	133	148
Output..... tons..	15,518	23,857	48,322	24,559	37,604

The catch of the river stations was utilized as follows:

	Tons.
Fish prepared for Russian market.....	2, 846
Fish canned for European market.....	105
Fish dry-salted for Japanese market.....	840
Fish fertilizer.....	4
Caviar, Russian method.....	215
	<hr/> 4, 010

The catch on the river stations in 1912 and 1913 was as follows:

	King salmon.	Chum salmon.	Hump- back salmon.	Sockeye salmon.	Coho salmon.	Dolly Varden trout.
	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>
1912, 12 stations.....	3, 000	246, 000	930, 000	480, 000	33, 000	71, 000
1913, 13 stations.....	4, 196	373, 812	1, 842, 090	226, 653	33, 195	99, 690

The fish from this district are gradually attracting the attention of buyers. The improvements in the equipment of fishing stations warrant preparing a better product and thereby diminish the dependency of the district upon the Japanese market.

In 1913 Schelohoff Bros., of Astrakhan, Suvoroff & Sons, of Odessa, Yasikoff, of Petrograd, and Kapeikin, a large Siberian fish dealer, made liberal advances of money to the fishermen in order that they might prepare the catch in accordance with the Russian method, and some of them commissioned their own specialists to superintend the preparation. It is only natural that under such conditions the district will gradually become independent of Japanese buyers. In 1911, out of 3,595 tons of fish products, 2,095 tons, or 58 per cent, were shipped to Japan; in 1912, of 2,831 tons, 835 tons, or 30 per cent; whereas in 1913, of 4,010 tons, only 845 tons, or 21 per cent, were shipped to Japan.

There were 12 canneries in the district in 1913, of which 2 were river stations, viz, Eckerman's on Polana River and Maynard's on Kolpokava River. The best canneries are well equipped with modern machinery and are run by a Japanese firm, which is backed by an English concern.

In 1913 the canneries on the coast produced 41,186 cases of canned salmon, and 4,208 cases were packed at river stations.

The largest cannery is located on the Osernaya River. The shore property is valued at \$100,000. There are 120 white, 30 Japanese, and 40 Korean employees. The company runs one transporting vessel of 2,200 tons valued at \$150,000, one power fishing boat of 400 tons valued at \$20,000, and eight lighters. The apparatus consists of two 250-foot haul or beach seines. In 1915 the catch was 60,000 sockeye, 500,000 humpback, and 75,000 chum salmon. The product was 5,200 cases (48 one-pound flat cans per case) of sockeyes valued

at \$40,000, 19,800 cases of humpbacks worth \$120,000, and 4,000 cases of chums worth \$24,000. Also 5,000 pounds of dry-salted humpbacks were prepared, as well as 7,200 pounds of salmon fertilizer worth \$72. This plant was built in 1914. The buildings are of steel shipped from England; the machinery is all American. One net is operated by the company and one by local inhabitants known as "colonists."

The Osernaya River is a natural place to find red, or sockeye, salmon, but owing to the Japanese concessions higher up the coast very few reds now reach the river.

Another plant is operated on the Bolsheresk River, the shore property being valued at \$5,000. This plant employs 200 whites and 50 Japanese and uses two 250-foot haul or beach seines. The product in 1915 was 700,000 pounds of pickled sockeye salmon. The concession at present is used for salting only, but the erection of a cannery for humpback salmon is being discussed. No reds are found in the river, but there is an abundance of humpbacks.

A Japanese firm has a cannery 5 miles north of the Osernaya River, employing 400 Japanese; the land plant is valued at \$35,000. The plant has one transporting vessel worth \$1,500, six lighters worth \$1,000, and three 5,000-foot floating traps valued at \$5,000. This cannery was built in 1913. The building is of wood and was constructed first in Hakodate, taken apart, and reassembled in Kamchatka. The machinery is American made. In 1914 the can-making machines were removed to Hakodate, and the cans are now made there. The company has three coast concessions, one at the cannery and one on either side. They put up 27,000 cases of sockeyes in 1913 and 15,000 cases in 1914. The product in 1915 was 20,000 cases (48 half-pound flat cans per case) of sockeyes, worth \$100,000; 18,000 cases (48 one-pound flat cans per case) of sockeyes, worth \$126,000, and 15,000 cases (48 one-pound flat cans per case) of humpbacks, worth \$60,000. They also dry-salt a considerable quantity of humpbacks.

Farther up the coast there is another cannery which makes its cans and does all work by hand. Beyond this plant there seem to be no sockeye salmon along the west coast of Kamchatka.

*East Kamchatka district*—This district covers the coast line of the eastern Kamchatka and Anadir Peninsulas, about 1,843 miles. The majority of the fishing stations are concentrated around Karaguinsky (Count Litka) Bay, in the straits from the Malo-Voyam River to Kitchigin River, about 135 miles long, and in the region of Kamchatka River.

The area closed to fishing in this district consists of the shore line, 7 miles to the west and  $2\frac{2}{3}$  miles to the east of the mouth of Kamchatka River.

The run of fish in 1913 was retarded very much by late ice, which remained until the end of June and in some places as late even as July. However, the run of fish, especially of chum salmon, was good. At some places (Pankara and Russakova Rivers) large schools of fish, averaging  $1\frac{1}{2}$  to 2 miles wide, appeared early in August, but the stations were closed. The Anadir River had a good run. There were hardly any runs of sockeye and coho salmon between the Kitchigin and Yki Rivers, and a rather small run in the region of the Kamchatka River, which is of special importance on account of the canneries.

In 1912 at 10 coast fishing stations 700,000 sockeyes and 250,000 cohos were caught, while in 1913, at nine stations only 393,000 sockeyes and 95,000 cohos were taken.

The catch of salmon at the coast stations for the years 1911 to 1913 was as follows:

	King.	Chum.	Humpback.	Sockeye.	Coho.
	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>
1911, 38 stations.....	8,000	3,085,000	1,627,000	750,000	218,000
1912, 54 stations.....	29,000	3,414,000	497,000	745,000	249,000
1913, 61 stations.....	30,167	6,464,224	2,623,997	399,207	98,043

The output amounted to 11,399 tons in 1911, 11,467 tons in 1912, and 21,192 tons in 1913. Of the 1913 product 250 tons of fish were salted according to the Russian method, 19,076 tons dry-salted by the Japanese method, 1,030 tons were canned, 700 tons of caviar were prepared for the Russian market, and 136 tons for the Japanese market. Twenty-five cases of crabs were also canned.

At the river stations, 28 in number, of which 26 were operated in 1913, the catch in that year was 1,315 king salmon, 1,055,045 chum salmon, 647,595 humpback salmon, 460,494 sockeye salmon, 54,780 coho salmon, 18,671 Dolly Varden trout, and 88,740 herring. Products prepared amounted to 1,405 tons of fish, Russian salted, 611 tons canned, 2,261 tons Japanese dry-salted, and 198 tons of Russian caviar, a total of 4,475 tons.

The grand total of the 1913 catch in this district was:

	King salmon.	Chum salmon.	Humpback salmon.	Sockeye salmon.	Coho salmon.	Dolly Varden trout.	Herring.
	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>
In conventional waters.....	30,167	6,464,224	2,623,997	399,207	98,043	.....	.....
Outside conventional waters	1,315	1,055,045	647,595	460,494	54,780	18,671	88,740
Total.....	31,482	7,519,269	3,271,592	859,701	152,823	18,671	88,740

The total output of prepared products was 25,668 tons, divided as follows: Fish, Russian salted, 1,655 tons; fish, canned, 1,641 tons; fish, Japanese dry-salted, 21,337 tons; Russian caviar, 898 tons, and

Japanese caviar, 137 tons. The total output in 1912 was 15,663 tons, and in 1911, 16,388 tons.

All canning factories in this district are located in the neighborhood of the Kamchatka River. One belongs to the Russian firm, Denbigh & Co., and the others to Japanese. Denbigh & Co. operate two excellently equipped power canning plants with American modern machinery, and during 1913, 1914, and 1915 they packed salmon as follows:

Years.	Sockeye.	Coho.	Chum.	Hump-back.	King.	Total.
	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>
1913.....	33,000	10,000	18,000			61,000
1914.....	41,203	11,253	19,103			71,559
1915.....	36,763	26,176	39,426	1,441	20	103,826

#### SOUTHWESTERN DISTRICT.

This district covers the waters from the southern boundary of the Amur River estuary (the line between Capes Lazaref and Pogibi) down to the Chosen frontier, including Vanina Bay, Imperial Harbor, Peter the Great Bay, and other bays. The total length of the shore line is about 1,350 miles.

This district may be divided into two principal parts: The northern, from Lazaref-Pogibi line to Cape Povorotni, which, with the exception of various bays, includes the conventional waters; and the southern part, composed of Peter the Great Bay and Posiet Bay, both of which are excluded from the conventional waters.

In the northern part the fishing stations are rented on the public-tender basis, and the great majority of the station owners and workmen are Japanese. Chum and humpback salmon are caught to some extent, especially the latter, but the principal fish is herring. The spring herring is made into fertilizer by the Japanese, and some fish oil is extracted. During the past three to five years the Tartar Straits fishermen have begun to salt herring in a very crude way, and the product commands a rather low price. The principal group of herring-fishing stations begins to the north of Imperial Harbor, about Datta Bay, and continues 50 to 60 miles to the south.

In the southern part there is a wider range in the varieties caught, viz: Crabs, shrimps, oysters, trepang, and sea kale. In this section fishing is exclusively in the hands of Russian subjects, who fish during the entire year.

Peter the Great Bay chiefly supplies the Vladivostok market with fresh and frozen fish, crabs, shrimps, etc., and during the spring run of herring large quantities, fresh and mildly salted, are shipped to Chosen, Japan, and China. It supplies Vladivostok with herring, bass, carp, flounders, trout, and chum and humpback salmon.

In conventional waters the 1913 catch was smaller than in 1912 and 1911 and was about equal to that of 1910, which was considered a poor year, as will be seen from the following figures: 1910, 25,000,000 herring and 1,383 tons of fish fertilizer; 1911, 32,800,000 herring and 2,033 tons of fertilizer; 1912, 27,950,000 herring and 1,857 tons of fertilizer; 1913, 25,070,000 herring and 1,388 tons of fertilizer.

In excluded bays the run was somewhat better, and in St. Olga and Vanina Bays it was very good. The result of the catch of herring for the years 1910 to 1913 was: 1910, 1,375,000; 1911, 2,050,000; 1912, 3,477,000; 1913, 2,441,000.

The poor catch of 1911 and 1912 greatly diminished the fishing interest in Peter the Great Bay, and the number of fishing stations decreased from 44 in 1912 to 17 in 1913. The catch of 1913 was, comparatively speaking, good, especially the herring catch. The following figures show the herring catch in the years 1910 to 1913: 1910, 6,018,000; 1911, 4,476,000; 1912, 5,142,000; 1913, 10,391,000.

The catch of dorse was smaller than in 1912; that of smelt was better. About 400,000 crabs were caught; about 15,000 of these were sold fresh at Vladivostok, and a small frozen consignment was shipped to European Russia. The balance, about 125 tons, was dried for the Chinese market.

Shrimp fishing is very little developed; about 10 tons were caught in 1913. Sea kale was obtained to the extent of only 1,000 tons. Only 125,000 oysters were brought to Vladivostok, and 9 tons of trepang were prepared for the Chinese market. These figures do not include fish, etc., caught by local peasants.

The grand total for 1913 of the catch in this district was:

	Peter the Great and other bays excluded by the convention, but including the catch of 33 villages.	Conventional waters.		Peter the Great and other bays excluded by the convention, but including the catch of 33 villages.	Conventional waters.
Number of fish caught:			Products prepared—Con.		
Chum salmon .....	102,000	36,000	Fish, fertilizer.. tons..	182	1,388
Humpback salmon..	213,000	445,000	Caviar, Japanese market..		5
Herring.....	15,849,000	25,070,000	Caviar, Russian market..	8	21
Dorse.....	933,000		Fish oil, Russian market..	31	85
Smelt.....	3,400,000		Fish for Russian market..	1,799	
Mackerel.....	150,000	1,900	Fish for Chinese and Chosen markets.		
Flounder.....	287,600		..... tons..	1,167	
Roach.....	79,000		Crabs..... do....	125	
Cod.....	46,000		Sea kale..... do....	1,866	
Trout.....		11,800	Trepang..... do....	9	
Sturgeon.....	155		Shrimps..... do....	29	
Others.....	761,000	467,000			
Products prepared:					
Fish, dry-salted for Japanese market					
..... tons.....		533			

*Import of herring at Shanghai.*—According to the “Priamurskaya Vyedomosti,” the agent of Commerce and Industry for China and Japan states that the Shanghai market is supplied with fish similar to herring, caught in Chinese waters, and the importation of herring depends upon the local catch of this fish, of which there is not enough to satisfy the demands. Large foreign firms import quantities of American and Japanese herring, the price varying from \$2.37 to \$2.84 per hundred pounds. The average weight of one herring is about 1 pound.

At the end of March or the beginning of April the catch of fish in Chinese waters begins, and therefore the prices on imported herring decrease. Toward warm weather the demand ceases altogether.

American herring, of an average weight of one-fourth pound, have a good market in Shanghai during autumn, winter, and spring, and they bring from \$2.37 to \$3.32 per hundred pounds.

All kinds of fish dried in the open air find a good market in Shanghai during the entire year. The prices range from \$2.84 to \$3.79 per hundred pounds, depending upon the kind of fish, the smaller sizes bringing better prices. The fish are packed in bales.

During recent years the Vladivostok fish dealers have made attempts to introduce their herring into China, but notwithstanding that their herring are better than the local or the American product the attempts have not been very successful. This is explained by the fact that the buyers of fish at Vladivostok do not live up to their contracts. There were instances where the boxes contained more Chinese cheap salt than fish. However, fish of good quality that have succeeded in reaching Shanghai have been well received, and consignments before the Chinese spring holidays have brought as much as \$8.50 per hundred pounds.

Up to the present Russian fish dealers have been dealing through small commission agents, whose services were not satisfactory. Unfortunately, almost all of the Russian fishermen in Vladivostok are without sufficient capital to place the industry on a business basis. They have not the money to secure a large catch early enough in the spring to enable them to deliver it to the market before the Chinese holidays and before the local fish appear on the market. The principal run of herring occurs after the Chinese holidays, and therefore arrangements are needed to enable the fishermen to preserve the fish until the fall, when the market again becomes profitable.

#### AMUR RIVER.

The figures obtainable of the Amur River fishing are far less accurate than those of sea fishing. The control of this fishing is intrusted to Government foresters and not to special men, as in the sea-fishing



districts; the foresters regard it as a secondary matter and give it scant attention. On the other hand, fish on the Amur are to a large extent replacing cereals for the local inhabitants, not only for natives but also for Russians, and for this reason as many free fishing stations are given to the inhabitants as are deemed necessary to insure their food supply. Owing to alleged abuse of this privilege and to the inadequate and lax control by the foresters, the several rules and regulations providing for close seasons for the most valuable fish and prohibiting the use of certain methods of capture can not, it appears, be enforced among the river fishermen.

The Amur River region is quite different from the northern waters. Here chum and humpback salmon are the principal fish, and two or three runs of each of these varieties occur annually. The Amur River fishing has a very far-reaching effect on the whole life of the Maritime and Amur Provinces. The principal fishing is concentrated in the northern part of the river and in its estuaries. The width of the river, the frequent storms during the runs, and the regulations governing the construction and size of the fishing gear all assist in allowing the fish to pass the innumerable fishing stations at the mouth of the river and its estuary and to reach the upper parts of the stream. The runs of fish up the river replace, in the Maritime Province, the harvest time in other sections of Russia. By far the greater part of the inhabitants along the river catch fish; they are eaten fresh and are salted, dried, and prepared in other ways for future consumption. In the diet of the peasants and natives of the Amur River system fish replaces grain. The natives prepare the fundamental food for their dogs from the fish heads and bones. In the Maritime Province the salmon ascend the Amur as far as the Ussuri River and its tributaries; in the Amur Province they often ascend as far as Blagovystchensk.

Beyond Nikolaievsk only the surplus salmon are sold, the bulk of the catch being prepared for home consumption.

The lower part of the Amur River and its estuary is occupied by the largest, oldest, and best fishing stations, some of which are already fully equipped with proper quays, sheds, ice cellars, and even refrigerators, electric lights, and yard railroads. The longer a station exists the better it is studied and the greater its value becomes. In March, 1916, public tenders were held for some of the best stations, and the increase in their value can be seen from the following figures: In 1908 one of these stations was leased for \$1,500; in 1912 the same lessee paid \$3,000 for it, and last March (1916) it was leased by an outsider for \$21,000. Another station, regarded as one of the best, was leased by the same man for 12 years at \$2,500 per annum; this year the old lessee offered \$48,000 for it, but was outbid by a new man, who offered \$58,000 per annum.

The expensive outfitting of the fishing stations, regardless of the rent period, is due to the fact that, in order to encourage better equipment, the Government introduced a clause into the rules of the rental contracts and the public tender conditions by which, in cases where fishing stations changed hands, the new owner must buy all the equipment from the former owner at cost price. In case the parties do not agree to the valuation of the property, the Department of Domains is authorized to appraise it, which valuation is binding for both parties. The practice of the last three to four years shows very satisfactory results from these conditions, and since the introduction of this rule many fishing stations have been improved and equipped to a greater extent than in former years.

Sturgeon, perch, bass, carp, and many other fishes are caught at the Amur River stations, but the volume of their catch is not large, and the fish are consumed locally.

Fishing on the Amur River is divided into two districts—the Mariinsk, or the lower Amur district, and the Khabarovsk district.

*Mariinsk district.*—This district includes the area from the village Troitskoe to the village Sophiskoe, or a tract about 278 miles long. Of 147 fishing stations existing in this district in 1913, only 27 stations were commercial; the balance (120) were given free to 18 Russian and 49 native villages.

The result of the 1913 catch of salmon was as follows, the total being compared with the two preceding years:

	Hump-back.	Chum.	
		Summer run.	Autumn run.
1913.	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>
Russian peasants.....		44,400	480,321
Natives.....		650	330,334
Commercial fishing.....		32,410	174,401
Total.....		77,460	985,056
Total, 1912.....	450	117,700	1,033,559
Total, 1911.....		78,461	1,118,770

In addition to the fish prepared for home consumption, the local inhabitants put some of the products on the market, viz: Salted summer chums 73 tons, autumn chums 1,476 tons, and 68 tons of caviar. In addition to this, 116 tons of summer chums, 877 tons of autumn chums, and 62 tons of caviar were prepared by commercial fishermen.

*Khabarovsk district.*—This district includes the river line from the northern boundary of the Mariinsk district up the river to Khabarovsk, about 127 miles. The district is very similar to the Mariinsk

district. In 1913 there were 39 free fishing stations in the district, allotted to 20 Russian and 19 native villages, and 3 commercial fishing stations.

According to official reports 278,514 fish were caught in 1913, i. e., 268,514 autumn chum salmon at the free stations and 10,000 at the commercial stations. About 154,000 fish were used for home consumption, the balance being sold fresh and salted in the neighboring markets.

Sturgeon fishing is greatly developed in this district; about 4,623 sturgeon, weighing over 34 tons, were registered in the 1913 catch, but the actual number is very much higher, as many fish were not registered. In addition to sturgeon, about 158 tons of pike, bream, carp, crucian carp, sheatfish, etc., were caught by the peasants.

## SUMMARY OF CATCH IN 1913.

The total number of fish caught in the waters of the Russian Far East, and the quantity of product prepared there, in 1913, is as follows:

## NUMBER OF FISH CAUGHT.

Districts.	Salmon.					Dolly Varden trout.	Herring.
	King.	Chum.	Humpback.	Sockeye.	Coho.		
Khabarovsk.....		278,514					
Mariinsk.....		1,062,516					
Nikolaievsk.....		18,262,373	7,468,794				12,600
Southwestern.....		138,750	657,981		1,915	11,824	40,919,600
Sakhalin.....		77,279	184,524				4,482,500
Okhotsk.....		1,235,050	245,266		3,198	17,035	
West Kamchatka.....	9,507	4,468,331	27,343,537	1,521,276	101,471	104,750	100,000
East Kamchatka.....	31,482	7,519,272	3,271,592	859,701	152,823	18,671	88,740
Total.....	40,989	33,042,085	39,171,694	2,380,977	259,407	152,280	45,603,440

## PRODUCTS PREPARED FOR MARKET.

Districts.	Salmon.		Herring.	
	For European market.	For Japanese market.	For European market.	For Japanese market.
	Tons.	Tons.	Tons.	Tons.
Khabarovsk.....	415			
Mariinsk.....	2,672			
Nikolaievsk.....	42,944	7,204	3	
Southwestern.....	310	533	784	1,881
Sakhalin.....	101	277	38	274
Okhotsk.....	741	2,867		
West Kamchatka.....	5,331	37,422	12	
East Kamchatka.....	4,180	21,473	11	
Total.....	56,694	69,776	848	2,155

## MISCELLANEOUS FISHES PREPARED BY DISTRICTS.

Species.	Khabarovsk.	Nikolai-evsk.	South-western.	West Kamchatka.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.
Sturgeon.....	34	113			147
Dorse.....			45		45
Mackerel.....			166		166
Smelt.....			50		50
Shrimp.....			29		29
Crab.....			125	5	130
Sea kale.....			1,867		1,867
Other.....	158	548	594		1,300
Total.....	192	661	2,876	5	3,734

## JAPANESE INTEREST IN RUSSIAN FISHERIES.

## EXPORTS FROM RUSSIAN FAR EASTERN WATERS TO JAPAN.

The "Vestnik Finansov, Promyshlennosti i Torgovli" (Messenger of Finance, Industry and Commerce; No. 50, of Dec. 13 to 26, 1915) gives the following statistics of the exports of fish from the Priamur district to Japan from 1907 to 1913, inclusive, showing the per cent of increase or decrease in each year as compared with the preceding:

Years.	Quantity.	Value.	Increase (+) or decrease (—) compared with preceding year.	Years.	Quantity.	Value.	Increase (+) or decrease (—) compared with preceding year.
	Tons.		Per cent.		Tons.		Per cent.
1907.....	34,058	\$1,421,398		1911.....	105,821	\$3,614,077	+32.38
1908.....	40,944	1,867,690	+21	1912.....	65,513	3,046,623	-38.08
1909.....	61,225	2,419,442	+48	1913.....	92,270	3,460,260	+13.34
1910.....	71,572	2,690,072	+18				

According to the kind of fish or products, the exports of 1913 consisted of the following:

Product.	Quantity.	Value.	Product.	Quantity.	Value.
	Tons.			Tons.	
Chum salmon.....	38,481	\$1,898,495	Caviar.....	436	\$25,805
Humpback salmon.....	47,987	1,138,693	Other.....	228	10,964
Fertilizer.....	2,383	109,721			
Canned fish.....	2,025	257,947	Total.....	92,270	3,460,260
Herring.....	730	18,635			

The localities or districts from whence these goods were shipped were as follows:

Districts.	Quantity.	Value.	Districts.	Quantity.	Value.
	Tons.			Tons.	
Kamchatka.....	62,900	\$2,889,734	Sakhalin.....	701	\$30,647
Nikolaievsk.....	2,738	141,106	Maritime Province.....	3,410	139,168
Tamlevo.....	3,200	141,597			
Okhotsk.....	2,652	117,981	Total.....	75,601	3,460,233

These goods were shipped to various Japanese ports. The importance of these ports as fish markets may be seen from the following figures which give the amount of fish landed during the period 1911-1913, in percentages of the grand total of imports:

Ports.	1911	1912	1913	Ports.	1911	1912	1913
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Hakodate.....	64.9	68.4	73.75	Tsuruga.....	3.6	1.1	1.19
Yokohama.....	10.6	10.1	9.38	Aomori.....	1.1	1.4	.59
Ningata.....	7.9	8.3	7.84	Others.....	1.2	1.4	1.04
Otaru.....	5.9	5.2	3.29				
Fusiki.....	4.8	4.1	2.92		100	100	100

## JAPANESE FISHING STATIONS.

The Japanese Advertiser of March 22, 1916, had the following in reference to Japanese fishing stations in the Russian far eastern waters:

Owing to the increased demand for tinned fish as provisions of war, the attention of industrial circles has been directed to fishing enterprises. The fishing along the coast provinces of Asiatic Russia has been made the object of much interest and competition among the Japanese and Russians. Though various knotty problems that impaired the interest of the Japanese have recently been settled in their favor by the lenient attitude of the Russian authorities, the Japanese have now been hard hit by the increase of the lease rate for the fishing zone. According to the statement of Mr. Matsuzaki, Director of the Marine Industry Bureau, the tender for the present year for the lease of fishing zones in the coast provinces has resulted in the loss of 26 zones for the Japanese side from that of last year. The quotations have risen remarkably, evidently because of the ever-increasing demand for preserved fish. For instance, a zone for which the Imperial Marine Goods Co., obtained the lease last year at 6,660 yen, has gone to a Russian concern at 21,000 yen. Another zone which a Japanese firm obtained at only 3,100 yen last year, has also gone to a Russian firm at 22,000 yen. The inability of the Japanese to bid higher may partly be ascribed to the shortage of ships and the rise in the charter rate, but the real reason is the Russian competition, caused by the prosperity in the trade in fish.

The fishing enterprise in the coast provinces has formerly been practically monopolized by Japanese. But the recent development in fishing has attracted the attention of Russian business men, and they have obtained the financial help of foreign capitalists interested and scored a success in the campaign. The fishing enterprise requires large and perfect tinning plants, but the Russians lack these plants, and it is easy to imagine that the foreign capitalists, having the plants at their disposal, have invested capital in backing the Russian fishermen. Mr. Matsuzaki has warned the Japanese fishing firms to beware of this new development.

The following is a table showing the number of fishing zones leased to Japanese and Russians for this and last year and the amounts of the leases:

Years.	Number of fishing zones.			Amount of lease.		
	Japanese.	Russian.	Total.	Japanese.	Russian.	Total.
1915.....	231	34	265	<i>Yen.</i> 702,244	<i>Yen.</i> 143,118	<i>Yen.</i> 845,362
1916.....	205	42	247	723,585	170,278	893,863

α A yen is equal to about \$0.498.

